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ON BLEACHING.

Concluded from page 84.

BLEACHING OF COTTON.

In treating of the method of bleaching linen, we have partly included also that of bleaching cotton goods, as far as the process is similar in both cases. But the nature of cotton is in several respects different from that of flax and hemp, and it will therefore, be necessary to point out in a particular manner the distinctive treatment which is required for stuffs derived from that substance.

Cotton is of a filamentous nature, and consists of a kind of down, which envelopes the seeds of the cotton-plant. After being separated from the seeds, it is always charged with a coarse coloring matter, which soils it, and renders it opaque. The presence of this unctuous matter is proved by the slowness with which cotton absorbs water before it is soured, and by the power with which it absorbs it after the operation; by which means, from being opaque, it is rendered clear and transparent.

Cotton varies a great deal in its qualities, according to the different kinds, the climate where it is produced, and the culture employed. Its color is sometimes yellow, and sometimes white, but, in general, it is of a dirty yellow.

To bleach it, does not require the same preparations as hemp and flax. The first operation consists in souring it in a slight alkaline solution, or what is better, by exposure to steam. It is afterwards put into a basket, and rinsed in running water. The immersing of cotton in an alkaline ley, however it be rinsed, always leaves with it an earthy deposit. It is well known, that cotton bears the action of acids better than hemp or flax; that time is even necessary before the action of them can be prejudicial to it, and by taking advantage of this valuable property in regard to bleaching, means have been found to free it from the earthy deposit, by pressing down the cotton in a very weak solution of sulphuric acid, and afterwards removing the acid by washing, lest too long remaining in it should destroy the cotton: Being washed from the sour, the goods are again boiled in soap, washed, and then immersed in the oxymuriate of lime. The boiling in soap, and steeping in the oxymuriate, is now repeated, until the stuff is a pure white. They are then soured and washed in pure spring water.

In bleaching the finer fabrics of muslin, nearly the same process is followed as the above for bleaching the coarser kinds; only that, on account of the fineness of the fabric, no pearl ashes are used in boiling, but soap alone. Otherwise, they are treated in the same manner, in being alternately washed, boiled and steeped in oxymuriate of lime; and when fully white, they are soured in dilute sulphuric acid.

In the bleaching of cotton cloth, where *fixed colors*, that is to say, such as resist the action of the alkalis in an eminent degree, are previously dyed in the yarn before it is wove into cloth; the oxymuriate of potash is preferable to that of lime, as the latter would be liable to darken the colors. To bleach these stuffs, it is necessary to work the dressings or starch well out in cold water, to boil them gently in soap, and, after again washing, to immerse them in a moderately strong solution of the oxymuriate of potash; and this process is followed until the white is good; they are then soured in dilute sulphuric acid. If the goods are attended to in a proper manner, the colors, in place of being impaired, will be found greatly improved, and to have acquired a delicacy of tint, which no other process can impart to them.

Pulicates, or ginghams, which have been wove along with yarn, which has been previously bleached, are first freed by washing, from the starch or dressing; they are then washed, or slightly boiled with soap. After which, they are completely rinsed in pure spring water, and then scoured.

BLEACHING FOR CALICO PRINTING.

If it be required to bleach linen and cotton cloth for the purpose of being stained with different colors, in the process of calico-printing, a pure white is not so much sought for, as that the goods are, what is technically called, well rooted; that is, that the coloring matter and vegetable oil is fully extracted from them. This is obtained chiefly by the linens being bucked and boiled in a solution of alkali, rendered moderately caustic by quicklime, in order to preserve the fabric of the cloth from being too much reduced. The alkaline solution must be well settled, and transparent as water; because, if the lime remains either in solution or suspension in the smallest proportion, it is apt to be precipitated into the fabric of the cloth, and destroy the purity of those parts intended to be white. Linen cloth requires to be bucked and boiled from ten to twelve times in the alkaline solution; being well washed, and exposed in the bleach-green between each operation. It is soured at the end of the sixth boiling; and again soured at the end of this process, when the goods are supposed fully bleached for printing.

To ascertain whether the cloth is fit for printing, a small stripe is torn from the end of one of the pieces, and printed with one of the mordants used in the fixing of the dye. After the mordant has remained a sufficient time in the cloth, it is rinsed in pure water to carry off the superfluous parts of the mordant, and then immersed into a copper-pan in cold water, which contains a little madder; the heat is gradually increased, while the cloth is alternately raised and lowered by a bit of stick in the decoction of madder, until the color is dyed to the shade required. At this period, if the cloth is properly bleached, the place stained with the mordant will alone have altered the coloring matter of the madder; while the rest of the rag remains white. But should the part intended for white be stained a dirty light

red, the cloth is not fully bleached, and it must again be boiled in the solution of alkali.

Cotton cloth intended for calico-printing is more easily bleached than linen cloth; four, or at most, six boilings in the alkaline solution, being all that is requisite for making a good white. One pound of potashes is fully sufficient to bleach a piece of calico of 21 square yards. This gives about three ounces of potash to each piece for every time they are boiled. Between every part of the boiling process, the calicoes are washed and exposed on the bleach-green, the same as linen cloth; and scoured, at the end of the process, in the same manner. In order to ascertain, whether they are fully bleached for printing, the same method is followed as that which is already described for the trial of linen cloth.

In bleaching both kinds for printing, it is not customary to immerse them in the oxymuriatic solutions; except in the winter months, when a good white is not so easily obtained by the action of the sun and air. Neither are the goods watered artificially when spread on the bleach-green; but they are, [after being well washed] allowed to be exposed to all the vicissitudes of the season, until the common routine of business calls for their return to undergo further operation. This process is commonly called dry bleaching, in contradistinction to that in which the goods are artificially watered when exposed on the field.

After linen or cotton cloth is printed and dyed, a certain dulness of color attaches itself to the parts intended to remain white; arising partly from the imperfection of the bleaching, but more frequently from a part of the mordant, which has been printed on the cloth, being loosened by the iron and temperature of the water-bath. This unites with the decoction of madder or other coloring matter used in the bath, and is precipitated on the parts intended to remain a pure white. To remove this partial stain in an easy manner, without long exposure upon the bleach-green, has long been much wanted by calico-printers.

In order to attain this, various methods have been resorted to without effect, arising partly from the imperfections of the

substances employed. Steeping printed goods after being dyed, in the oxymuriate of lime, not only changes all the colors, and renders them of a duller hue; but also particles of the lime attach themselves so intimately to the cloth, that it acts as a discharge, and effaces the colors altogether. Although a dilute solution of the oxymuriate of potash, does not act in so sure a manner as the oxymuriate of lime, yet it operates strongly as an alterative to most colors; changing the red color to pink, and the purple and lilac are turned to bluish shades of the same color; besides, the action of the alkali scourges the whole colors, by reducing their intensity and brilliancy. In consequence of these defects, both these substances are unfit for producing a good white on printed goods; without at the same time acting as an alterative, in completely changing the shade of color wanted.

The oxymuriate of magnesia seems to possess none of the inconveniences attached to the two substances just now mentioned, and to answer in the most complete manner, not only for clearing the white ground of the goods, but also in preserving the colors of the same shade, which they were originally.

Of all the earths which are particularly soluble in water, magnesia possesses the property of changing color least; the alteration made by it on paper stained with litmus being scarcely perceptible. It is therefore peculiarly fitted, when united with oxygen, for the purpose of clearing the stain from the white of printed goods.

The oxymuriate of magnesia may be prepared in a manner entirely analogous, to that which we have already described for the preparation of the oxymuriate of lime, and the oxymuriatic acid may be distilled either from a mixture of common salt, manganese and sulphuric acid, or else from manganese with muriatic acid. In the latter case two parts of muriatic acid of the specific gravity of 1200 are added to one part of good manganese.

When the magnesia is dissolved, and the impurities which it may contain have subsided it is drawn off with pure water, and the heat is raised to about 160 or 170 degrees of Fahrenheit. So much of the oxymuriate of magnesia is then added as

will give to the water in the copper a sensible taste of the salt. As soon as it is introduced, the whole must be quickly mixed together by a clean broom. The printed goods, having been previously slightly braned, are then quickly run into the copper, in which they are continued until the white is sufficiently clear. This operation takes only a few minutes. The goods are then carried to be streamed in pure water, to prevent the further action of the oxygen on the colors. By the addition of a little more of the oxymuriate of magnesia, fresh parcels of goods may be entered into the copper for clearing, and the process may be thereby continued for a whole day; after which the contents are run off from the boiler.

BLEACHING OF WOOL.

The substances produced by the animal kingdom, differ essentially in their constituent principles from vegetables. Vegetables serve as the nourishment to the animals and insects, the spoils of which we employ. Animalized by their organs, they acquire other properties. We shall here confine ourselves to the examination of wool and silk, as the animal substances most generally employed for clothing.

Wool is a kind of hair with which the bodies of several animals are covered. It is composed of filaments or tubes, filled with an oily or medullary substance. The sides of these tubes are perforated with a multitude of small pores, which communicate with a longitudinal tube. By chemical analysis, wool gives a great deal of oil, and carbonate of ammonia; caustic alkaline leys dissolve it entirely. It experiences no change in boiling water; it alters very little when preserved in a place well aired; acids have very little action on it; when exposed to a strong heat, it enters into fusion.

An examination of these chemical facts is necessary for understanding the principles which ought to direct the artist in the bleaching of this substance. The little action which acids have upon wool, and its unalterableness in water even when aided by heat, render it necessary to have recourse to alkaline or suponaceous leys; but its solubility in these salts shews, that great prudence and caution must be employed. In regard to

acids, none have been hitherto used, but the sulphurous acid, obtained in the gaseous state by combustion.

In the preliminary operations to which wool is subjected, it is customary to leave a little of its grease, to secure it from insects. Wool is often freed from the grease by the farmers, when they wish to sell it at a high price, but in the subsequent manipulations, it is greased or oiled, before it is combed, spun, &c. and as this fat matter attracts dirt, it dirties and thickens the stuffs. The first kind of bleaching to which wool is subjected, is to free it from these impurities. This operation is called *scouring*. In manufactories, it is generally performed by means of an ammoniacal ley, formed of five measures of rain-water and one of stale urine; the wool is immersed for about twenty minutes in a bath of this mixture, heated to fifty-six degrees; it is then taken out, suffered to drain, and then rinsed in running water; this manipulation softens the wool, and gives it the first degree of whiteness; it is repeated a second, and even a third time, after which the wool is fit to be employed.—In some places, scouring is performed with water slightly impregnated with soap; and indeed, for valuable articles, this process is preferable, but it is too expensive for articles of less value.

Fulling the cloth adds still to its whiteness, and if an increased degree be necessary, it may be procured by the action of the sulphureous acid; that is to say, of the fumes of sulphur in a state of combustion, or the vapor of that acid condensed and combined with water.

Sulphuring is generally performed in an arched or very close chamber, constructed in such a manner, that the articles to be exposed to the action of the sulphur can be suspended on poles. The chamber being filled, a certain quantity of sulphur is put in a state of combustion in flat dishes, having a large surface with very little depth; the entrance is speedily shut, and all the interstices around the door are carefully stopped to prevent the access of the atmospheric air. The acid generated by the combustion of the sulphur, penetrates the stuffs, attacks the coloring matter, destroys it, and effects the bleaching. The stuffs are left in the stoves some time after the deflagration has

ceased. This time varies from six to twenty-four hours. They are then taken out, and made to pass through a slight washing with soap, to remove the roughness they have acquired by the action of the acid, and to give them the necessary softness.

This process is imperfect. At first, the acid of the sulphur acts only on the surfaces, and does not penetrate. This occasional immersion is not sufficient; the gas cannot introduce itself to a sufficient depth into the stuffs, and the superficies only is whitened.

A superior method has been lately invented, which is by making use of the sulphureous acid, which has been already described.

The sulphureous acid, or that acid generated by the imperfect combustion of sulphur, differs from the sulphuric acid [oil of vitriol,] by its containing less of the acidifying principle, and by being, as we may say, the mean term between sulphur and the sulphuric acid.

Sulphureous acid gas unites very easily with water, and in this combination it may be employed for bleaching wool and silk The sulphureous acid in this state of liquidity, may be prepared by making it pass through water in an apparatus nearly similar to that used for preparing chlorine or oxymuriatic acid. The most economical method of obtaining it, is to decompose sulphuric acid by the mixture of any combustible matter capable of taking from it a part of its oxygen. In exact experiments of the laboratory, when the Chemist is desirous of having great purity, it is obtained by means of metallic substances, and particularly by mercury; but for the purpose of which we are treating, where great economy is required, we would recommend the most common substances. We shall therefore give the following process:

Take chopped straw, or saw-dust, and introduce it into a matress; pour over it sulphuric acid, applying at the same time heat, and there will be disengaged sulphureous acid gas [vapor of sulphur] which may be combined with water in the apparatus.

The pieces are rolled upon the reels, and are drawn through the sulphureous acid, by turning them until it is observed that

the whiteness is sufficiently bright. They are then taken out, and are left to drain on a bench covered with cloth, lest they should be stained in consequence of the decomposition of the wood by the sulphureous acid; they are next washed in rain water, and Spanish white is employed, if it should be judged necessary. This operation is performed by passing the pieces through a tub of clear water, in which about eight pounds of Spanish white have been dissolved. To obtain a fine whiteness, the stuffs, in general, are twice sulphured. According to this process, one immersion, and reeling two or three hours, is sufficient. *Azuring* or *bluing* is performed by throwing into the Spanish white liquor, a solution of one part of Prussian blue to two parts of water, shaking the cloth in the liquid, and reeling it rapidly.

The operation is terminated by a slight washing with soap, to give softness and pliability to the stuffs. The final operations of *drying*, *stretching*, *pressing*, *&c.* are foreign to our present subject.

BLEACHING OF SILK.

Silk is a semi transparent matter, spun by a caterpillar, and formed of a substance contained in its body, which becomes hard in the air. This insect inhabits warm climates, being indigenous in Asia: it was naturalized in Europe about the time of the downfall of the Roman empire. Its culture would succeed perfectly well in the United States from Georgia to Connecticut.

The filaments prepared by the silkworm, are rolled up in a cod or ball. In this state, in which we find it, it is covered with a yellow varnish, which destroys its brilliancy and renders it rough. Silk, by chemical analysis, gives carbonate of ammonia and oil; water, at a boiling heat, produces no effect upon it; alkalies make it experience no change; but concentrated alkaline leys attack and dissolve it.

To give splendor to silk, it must be freed from its varnish. This covering is soluble in alkaline leys. Silk is generally scoured by means of soap, by which it loses one fourth of its weight. The matter disengaged from it is very fetid, and is

the silk be not rinsed in plenty of water, putrid fermentation will take place. Even when the best soap is used, it is generally suspected that it injures the whiteness of the silk. The splendor of the Chinese silks is brighter than that of the European; and the Chinese employ no soap in their operations. A slight alkaline ley will dissolve the varnish of the silk without using soap, and this has also been effected by the action of boiling water at a very high temperature.

The method which has been used successfully in France, is as follows:

Take a very weak solution of caustic soda, and fill with it the boiler of the apparatus for bleaching with steam.* Charge the frames with skins of raw silk, and place them in the apparatus until it is full; then close the door and make the solution boil. Having continued the ebullition for twelve hours, slacken the fire, and open the door of the apparatus. The heat of the steam, which is always above 250°, will have been sufficient to free the silk from the gum, and to scour it. Wash the skins in warm water, and having wrung them, place them again on the frames in the apparatus, to undergo a second boiling.—Then wash them several times in water, and immerse them in water somewhat soapy, to give them a little softness.

Notwithstanding the whiteness which silk acquires by these different operations, it must be carried to a higher degree of splendor by exposing it to the action of sulphureous acid gas, in a close chamber, or by immersing it in sulphureous acid, as before recommended for wool.

BLEACHING PRINTS, AND PRINTED BOOKS.

An application has been made of the new mode of bleaching, to the whitening of books and prints that have been soiled by smoke and time.

Simple immersion in liquid chlorine or oxygenated muriatic acid, letting the article remain in it a longer or shorter space of time, according to the strength of the liquid, will be sufficient

* For the description of this apparatus, see below, under the head of, *bleaching by steam.*

to whiten an engraving. If it be required to whiten the paper of a bound book, as it is necessary that all the leaves should be moistened by the acid, care must be taken to open the book well, and to make the boards rest on the edge of the vessel, in such a manner, that the paper alone be dipped in the liquid: the leaves must be separated from each other, in order that they may be equally moistened on both sides.

The liquor assumes a yellow tint, and the paper becomes white in the same proportion; at the end of two or three hours, the book may be taken from the acid liquor, and plunged into pure water, with the same care and precaution as recommended in regard to the acid liquor, that the water may equally touch the two surfaces of each leaf. The water must be renewed every hour, to extract the acid remaining in the paper, and to dissipate the disagreeable smell.

By following this process, there is some danger that the pages will not be all equally whitened, either because the leaves have not been sufficiently separated, or because the liquid has had more action on the front margins than on those near the binding. On this account the best way is to destroy the binding entirely, that each leaf may receive an equal and perfect immersion, and this is the second process recommended by count Chaptal.

"They begin," says he "by unsewing the book and separating it into leaves, which they place in cases formed in a leaden tub, with very thin slips of wood, or glass, so that the leaves, when laid flat, are separated from each other by intervals scarcely sensible. The acid is then poured in, making it fall on the sides of the tub, in order that the leaves may not be deranged by its motion. When the workman judges by the whiteness of the paper, that it has been sufficiently acted upon by the acid, it is drawn off by a cock at the bottom of the tub, and its place is supplied by clear fresh water, which weakens and carries off the remains of the acid, as well as the strong smell. The leaves are then to be dried, and after being pressed, may be again bound up."

"The leaves may be placed also vertically in the tub, and this position seems to possess some advantage, as they will be

less liable to be torn. With this view I constructed a wooden frame, which I adjusted to a proper height, according to the size of the leaves which I wished to whiten. This frame supported very thin slips of wood, leaving only the space of half a line between them. I placed two leaves in each of these intervals, and kept them fixed in their place by two small wooden wedges, which I pushed in between the slips. When the paper was whitened I lifted up the frame with leaves, and plunged them in cold water, to remove the remains of the acid, as well as the smell; this process I prefer to the other."

"By this operation books are not only cleaned, but the paper acquires a degree of whiteness superior to what it possessed when first made. The use of this acid is attended also with the valuable advantage of destroying ink spots. This liquor has no action upon spots of oil or animal grease; but it has been long known, that a weak solution of potash will effectually remove stains of that kind."

"When I had to repair prints so torn, that they exhibited only scraps pasted upon other paper, I was afraid of losing these fragments in the liquid, because the potash became dissolved. In such cases I enclosed the prints in a cylindric glass vessel, which I inverted in the water in which I had put the mixture proper for extricating the oxygenated muriatic gas. This vapor, by filling the whole inside of the jar, acted upon the print; extracted the grease as well as ink spots; and the fragments remnaied pasted to the paper."

EASY METHOD OF PREPARING THE OXYGENATED MURIATIC ACID.

To prepare oxygenated muriatic acid in an extemporaneous manner, nothing is necessary but to dilute muriatic acid, and to mix it in a very strong glass vessel, furnished with a glass stopper, with the black oxide of manganese, or else the red oxide of lead [red lead] in powder, and in such a manner that the mixture may not occupy more than one-third of the contents of the glass. Air-bubbles are formed on the surface of the liquor; the empty space becomes filled with a greenish vapor; and at the end of some hours, the acid may be further diluted with water

and then used. It has an acid taste, because, according to the French theory, the whole is not saturated with oxygen; but it preserves all the virtues of the oxygenated muriatic acid. This process may be followed, where there is not time to set up an apparatus for distilling, in order to procure the oxygenated acid.

BLEACHING OF PAPER.

The oxygenated muriatic acid has also been applied to the bleaching of paper, which it has rendered considerably more expeditious.

Bleaching of old printed papers, to be worked up again.—Boil the paper for an instant in a solution of soda, rendered caustic by potash. Steep it in soap-water, and then wash it, after which the paper may be reduced to a pulp by the paper-mill.

Bleaching of old written papers, to be worked again.—Steep the papers in a cold solution of sulphuric acid in water, after which, wash them before they are taken to the mill. If the acidulated water be heated, it will be the more effectual.

Bleaching of printed papers, without destroying the texture of the leaves.—Steep the leaves in a caustic solution of soda, and afterwards in one of soap. Arrange the sheets alternately between cloths, in the same manner as paper-makers dispose their sheets of paper when delivered from the form. Put the leaves in a press, and they will become whiter, unless they were originally loaded with printer's ink or size. If this should not completely effect the whitening of the leaves, repeat the process a second or even a third time.

Bleaching colored rags to make white paper.—Soak or macerate the rags sufficiently, put them into a solution of caustic alkali, and then into the oxymuriate of lime, prepared in the manner described above; and lastly steep them in diluted sulphuric acid.

BLEACHING BY STEAM.

In order to render the article on bleaching as complete as the plan of our publication will admit, it will be necessary to

give an account of the method of bleaching by steam, which, though inferior, in our opinion, to that by oxymuriate of lime, may be substituted to it with advantage, whenever the ingredients necessary for the preparation of this chemical agent are of a price too high to admit of the exclusive application of the French method.

Bleaching by alkali, purified of carbonic acid by lime, and assisted by a high temperature, has been long practised in secret in the Levant; it is now introduced in Europe and in America as a recent and valuabe discovery, and was first published by count Chaptal. In this method, a small quantity of ley is put into the bottom of a boiler. Cloth or yarn steeped in the same kind of ley is loosely thrown into the boiler, and suspended in it on racks or grates of wood; it is closed with a steam-tight cover, and to prevent accidents from the violent expansion of steam in a high temperature, a safety-valve is attached to it. Heat is then applied a few hours, the steam and heat are equally diffused, penetrate the fibrous texture of each thread, and increase the solvent power of the alkali; the coloring matter is completely and speedily united with the ley, and easily removed by washing. As the action of soda upon cloth, even in its pure and caustic state, is less violent than the action of potash, the operation is sometimes commenced with a ley of soda; but this is not absolutely necessary.*

A small boiler is set in a furnace, on count Rumford's plan, and a cut stone dome like an oven, erected above it; this is furnished with a steam tight inner door, armed with a safety-valve; in this dome two reels for winding up pieces of cloth are fixed, like common reels, to turn vertically. In the inside of the boiler two rollers are fixed, one near each reel; when a number of pieces of linen or cotton cloth are connected and wound upon one of these reels, an end of one is drawn under the rollers, and attached to the other reel, on which there is no cloth; when this

* The apparatus for bleaching with caustic alkaline vapor is described by Chaptal and improved by O'Reilly, in his *Essay on Bleaching*; a description and drawing of it are likewise in the 10th volume of the *Philosophical Magazine*.

reel is turned, it draws the cloth off the first, and so on the contrary. The cloth being freed from the dressing, in the common way, is immersed in alkaline caustic ley, wound upon one of the reels, passed under the rollers, and attached to the other reel: the boiler is then filled eighteen inches deep, with purified ley; this covers the rollers and that part of a piece extended under them. These rollers are so fixed that they can be unhooked at pleasure, and the cloth passed through the ley in the boiler, or through the steam only, as the operator chooses. The workmen continue to wind the cloth off-and-on these reels for two or three hours, about which time the coloring matter is sufficiently dissolved. It is then washed, immersed in the oxymuriate of lime, exposed three or four days on the green, steeped in diluted sulphuric acid, and finished.

This process has been likewise recommended for purifying linen and linen rags. These might be placed on frames, and exposed to the vapor of weak ley, the impurities with which they were charged, would soon be dissolved, and by washing them in pure water, or in water slightly saponaceous, all the dirt would be removed, and complete whiteness obtained. This method ought to engage particularly the attention of the managers of public hospitals; it would be attended with considerable saving, and completely destroy the power of infectious vapors, which might have been condensed upon the clothes of the sick.

ON COAL.

Its Natural History—Mining of Coal—Phenomena occasioned by Fire-damp—Method of Coking—Distillation of Tar from Pit-coal—Gas-light—Coal, a Manure.

I. NATURAL HISTORY OF COAL.

THERE are few productions of nature which present to the philosopher a wider field of investigation than pit-coal. A substance highly inflammable is found in the deep recesses of the earth, sometimes loaded with numerous superincumbent strata of hard rock, and extending frequently along with these strata

through a vast expanse of territory. Though metals may be said to be inflammable substances, as they combine more or less rapidly with oxygen when placed under particular circumstances, yet the character of rapid combustion with disengagement of light and heat, seems to belong principally to such substances as are derived either from the animal or vegetable kingdom. That this is probably the case with regard to coal we are further induced to believe, by the remarkable circumstance, that the chemical analysis of this natural production yields especially, though in various proportions, those materials which constitute essentially the vegetable. And if any thing was wanting to confirm us in that opinion we might trace in a number of fossile substances the gradual transition of the vegetable into the state of mineral coal. This fact is so intimately connected with the natural history of coal, that we cannot think it superfluous to give it some farther development.

Among the great number of principles which the chemist is capable of tracing in the vegetable kingdom, the presence of *extract*, *resin* and *fibre* seem to form the characteristical marks of plants.—If vegetable matter be boiled in water, and the water, after having been strained and filtered, be exposed for some time to the open air, a flocculent precipitate takes place from every part of the liquor; which soon subsides to the bottom of the vessel containing it. This is the *extract*; altered, indeed, by exposure, and now no longer soluble in water, a change which is supposed to depend on the absorption of oxygen; and if, by any means the proportion of oxygen be increased, the extract gradually becomes of a darker color, blackens, and approaches to the state of charred wood.

If vegetable matter be boiled in rectified spirit of wine, and water be added to the filtered liquor, a white precipitate commonly takes place; which if collected and examined, will be found to possess those properties which constitute what is called a *resin*.

By these means then the presence of *extract* and *resin* may be ascertained; the existence of *fibre*, the last of the three tests of the vegetable character above mentioned, may be ascertained by the eye, and by mechanical division.

A minute detail of the process by which vegetable matter is mineralized, is beyond the scope of our publication. It will be sufficient to state, that during the change which vegetables undergo in the situations above alluded to, their extractive and resinous particles gradually disappear, and they are proportionally impregnated with bitumen; and that their fibre blackens, approaches to the character of charred wood, and is gradually obliterated.

The extract is the principle, the traces of which first disappear; the resin next; the fibre last: and when every mark of organization has been lost in consequence of the destruction of the fibre, the substance is commonly of a compact texture; and when broken, presents conchoidal surfaces like pitch. In this state it may be properly called *coal*.

Thus far every thing seems to give evidence in favor of the vegetable origin of coal; but the situations in which the coal-strata are found, and most of the circumstances connected with their geological history, present such perplexing appearances, that *in the present state of science*, we must candidly confess that we are incapable of giving fully a consistent explanation of the manner in which the accumulation of these masses originally took place. The spirit of true philosophy is *scepticism*, and until we have further penetrated into the secrets of nature, let us collect carefully those *facts*, which experience and observation lay down before our eyes, without building upon them the lofty structure of hypotheses, which the discoveries of the next day may totally overthrow.

In the enumeration of the different varieties of mineralized vegetable substances, we shall not follow any systematical order, but arrange them, as nearly as possible, according to the progress of the change which has been above described.

WOOD OF A SUBMARINE FOREST.

Mr. Hatchett, in making some experiments on the wood of a submerged forest, at Sutton, on the coast of Lincolnshire, found that its ashes afforded alkali, and as from all the circumstances of its history, it appears that the wood has scarcely undergone any change in its vegetable character; he infers, that mere sub-

mersion is not sufficient to destroy the alkali of a vegetable, unless it has at the same time been more or less converted into coal.

TURF.

The roots and stalks of vegetables, growing in heaths and morasses, commonly undergo that spontaneous alteration which has been already described; and this process continuing to take place upon fresh vegetables, the accumulated mass becomes of a considerable thickness; and is then commonly made use of as fuel, under the name of *turf*.

PEAT.

In examining turf in its native situation, it will be seen, that in proportion as it is further removed from the surface, the form of the roots and fibres becomes less distinct; until the whole appears like a compact slimy mass of a black color: in which state it is called *peat*. This substance is used very extensively for fuel in many parts of Europe, especially in Holland; being first cut into separate pieces of about the size and shape of a brick, and then dried.

The unpleasant smell occasioned by the combustion of turf, and peat, arises partly from the bitumen, and partly from the decayed vegetable matter mixed with it.

IMPERFECTLY MINERALIZED LEAVES.

Mr. Hatchett* analyzed a variety of schistus, the stratum of which was found by Sir Joseph Banks near Reykum, one of the great spouting hot springs of Iceland. The schistus, which is easily divisible, consists in a great measure of leaves interposed between its laminæ: the form of the leaves and the arrangement of the fibres are distinctly visible; but the substance is apparently half charred. From several circumstances Mr. Hatchett conjectured, that the substance was not complete charcoal; and that the vegetable matter was in an incipient state of carbonisation; and found, by experiments instituted for the purpose, that

* See a very interesting memoir of this chemist in the *Philosophical Transactions for* 1804.

250 grains of the schistus afforded about three grains of *extract*, and one grain of *resin*: the remaining 247 grains, submitted to the process of destructive distillation, gave the following results:

Water	42, 50.
Thick brown oily Bitumen .	7, 50.
Mixed Gas* . . .	23, 75.
Charcoal	54, 25.
Silex	98.
Alumina	15.
Oxyd of iron . . .	6.
	247, 00.

The charcoal when burnt afforded no trace of any alkali.

BOVEY-COAL.

The substance so called consists of the branches, trunks, and roots of trees that have to a greater or less extent in different parts, undergone that alteration, by which the vegetable principles are charred, and converted into bitumen. Its color is light brownish black; it occurs in mass; its longitudinal fracture is fibrous lamellar, passing into slaty or woody, and is slightly glimmering. Its cross fracture is more or less conchoidal, with a shining resinous lustre. It acquires polish by friction, and is moderately hard. Its specific gravity is 1, 4, that of distilled water being 1, provided it is pure; when mixed with pyrites, it is often considerably heavier.

Bovey-coal is analogous to the *surturbrand* of Iceland; the *piligno* of the Italians, and the several varieties of bituminous wood, sometimes called *lignite*. Besides Bovey near Exeter, it is found in other places in England, in the territory of Hesse, and other parts of Germany, in Transylvania, in Denmark, Iceland, Greenland, the Ferroe Islands, &c.

In America we have examples of this species of coal bedded in clay on the banks of Crosswicks creek, New Jersey,

* By mixed gas is here meant a mixture of hydrogen, carbonated hydrogen and carbonic acid in various proportions.

and on Christiana-creek, state of Delaware. Whole trees are found in this condition, several feet below the surface, about one mile from Wilmington, Delaware. It also occurs on Colonel Ridgeley's farm near Baltimore, and large quantities of it are found on the banks of the river Missouri. Pyrites are often found mixed with this coal in the above situations.

The general appearance of Bovey-coal, and the alluvial character of the spots where it is commonly found, sufficiently manifest its origin; and shew that the alteration it has undergone depended on a process analogous to that which takes place in the formation of turf and peat. From the completely vegetable appearance of many specimens, the Bovey-coal may be traced by insensible gradations into a state in which every feature of the vegetable is lost, and the substance, in color, lustre and fracture, completely resembles pitch. In some instances it is obtained in the form of straight flat pieces, three or four feet in length resembling boards: in which state it is called board-coal. This flattened form of substances originally cylindrical, as the trunks and branches of trees, is observable in the surturbrand or bituminous wood of Iceland, as well as in the Bovey-coal, and also in other similar situations. We possess in our collection flattened pieces of this bituminous wood, which were thrown up by the earthquake in the month of December 1811, near New-Madrid, on the Mississippi. The same observation extends to all organic remains met with in strata of clay or argillaceous schist, for these are constantly of a flattened form, even in the case of bone and shells; so that the same substances, which in a calcareous stratum preserve for instance their original cylindrical figure, in a stratum of argillaceous schistus are compressed into a plane triangular surface. Bergman, who first remarked the fact, observes that this effect cannot be attributed to mere pressure; because it sometimes occurs in schist, lying over a calcareous stratum; in which case, as the pressure must necessarily have been greatest upon the lowest stratum, the form of the substance contained in that ought to have been more altered than in the other; whereas the contrary happens. He supposes therefore that the compression of these substances depended in part upon their having been

previously softened by incipient putrefaction, and this reasoning, Mr. Hatchett observes, is applicable probably to vegetable matter; but not to such substances as shells. Mr. Hatchett thinks it therefore probable, that this alteration of form has been in a great measure produced by a powerful mechanical action, exerted by the contraction of the argillaceous strata in consequence of dessication; and that in the case of vegetable matter this form may have been aided by a change in their solidity, as supposed by Bergman, and by the pressure of the superincumbent strata.

The analysis of 200 grains of Bovey-coal gave the following results:

Water	60.
Thick brown oily Bitumen .	21.
Charcoal	90.
Mixed Gas . . .	29.
	200

By combustion of the charcoal obtained in this analysis four grains of yellowish ashes were left, consisting of silex, alumine and oxyd of iron; derived most probably from the earthy matter in which the Bovey-coal is imbedded; but there was not the smallest trace of any alkali.

JET OR PITCH-COAL.

The color of jet is velvet black. It occurs in mass, in plates, and sometimes in the shape of branches and trunks with the true ligneous and fibrous texture. It has a brilliant resinous lustre, and a conchoidal fracture; it is soft and brittle, but not so much so as asphaltum. It becomes electric by friction, but slightly and with difficulty. Its specific gravity is 1, 25. It burns with a greenish flame and a bituminous odor, but which is not so strong as that of asphaltum. It occurs in Spain, the south of France, and in the Prussian amber-mines, where it is called black amber. As it may be turned easily in a lathe, it is frequently manufactured in France into buttons, beads and other trinkets.

It is met with commonly in the neighborhood of coal in detached nodular masses. One of these nodules, however, we picked up in a field near Harrisburgh, Penn. where until now no coal-bed has been discovered.

From all the circumstances of its history, jet appears to be a variety of mineralized wood, in which the proportion of bitumen is not very great.

Some mineralogists have classed jet among the simple bituminous substances, as a species of asphaltum, but the characters above described establish an essential difference between both, and to these we may add the circumstance, that jet does not swell up and melt, when set on fire, as asphaltum does.

COMMON COAL.

CARBO FOSSILIS, LITHANTHRAX.

The natural transition of vegetable matter into a substance completely resembling coal, both in external and chemical characters, may be traced by the most gradual and satisfactory steps. A similar conversion of the one into the other may be effected also by artificial processes, some results of which resemble so closely in their appearance common coal, that no eye, however experienced, can detect the difference; although the difference between their present and their original form is much greater than between that of common coal and vegetable matter in general; this will be readily admitted upon stating, that some of the specimens in question are nothing more than an altered state of colorless vegetable oils.

There is no absurdity therefore in supposing, that coal in general may have been derived from the gradual alteration of vegetable matter.

The varieties of coal are so numerous, and the shades which distinguish them often so inconsiderable, that it would be impossible to furnish of them a complete and satisfactory catalogue. In England only, seventy different varieties are brought to the market. We shall consequently content ourselves with a short notice of those varieties which possess the most distin-

guished characters and denote them by the names of the places, where they are found in the largest quantity.

CANNEL-COAL.

The color of this coal is dark greyish black. It occurs in mass, and has a glistening resinous lustre. It has a broad laminated structure, but if broken transversely to the laminæ, it exhibits undulating conchoidal surfaces. It is much less frangible than common coal. Its specific gravity is 1, 23 to 1, 27.—It does not stain the fingers. It is very inflammable, and crackles and flies while burning. It flames much and burns quickly, does not cake, and leaves from three to four per cent. of ashes. It is probable that its name is derived from the bright flame with which it burns, and which is similar to that of a *candle*: *cannel* being the common pronunciation of *candle* in Scotland and in the north of England.

According to the analysis of Kirwan, it contains in 100 parts:

Charcoal	75, 20
Bitumen	21, 68
Ashes, consisting principally of Alumina and Silex	3, 12
	100, 00

The *Splent-coal* of Scotland is a coarse slaty variety of the above, containing pyrites, and leaving, after combustion, about 20 per cent. of ashes.

In some places this kind of coal is likewise called *Parrot-coal*; perhaps from the crackling noise that takes place during the time that it is kindling.

Cannel-coal occasionally occurs in the Newcastle pits, in Ayrshire in Scotland, and elsewhere; but the largest beds of it, and of the purest kind, are near Wigan in Lancashire. It is an excellent fuel; it will take a good polish, and may, with care, be turned in a lathe into snuff-boxes and other trinkets, which are often passed off for true jet.

Dr. Hutton, in speaking of this species of coal, remarks, that it seems to break chiefly in two directions, that is, either parallel or perpendicular to the bed. It is therefore commonly in rectangular pieces, in which it is extremely difficult to

distinguish the bed, or stratification of the mass. By an expert eye, however, this may in general, or at least sometimes, be seen; and then by knowing the habit of the coal in burning, a person perfectly ignorant of the philosophy of the matter may exhibit a wonderful sagacity or even power over future events, on applying this body to fire; for at his pleasure, and unknown to those who are not in the secret, he may apparently make this coal either kindle quietly, or with violent crackling, and explosions; throwing its splinters at a distance.

The explanation lies in this, that though the rectangular mass of coal appears extremely uniform in its structure, it is truly a stratified mass; it is therefore affected by the sudden approach of fire, in a very different manner, according as the edge of the stratum shall be applied to the fire. When the edge of the coal is exposed to the fire, the stratification of the coal is opened gradually by the heat, and expanding vapors, as a piece of wood of a similar shape would be by means of wedges placed in the end way of the timber. The coal then kindles quietly, and quickly flames, while the mass of this bituminously schistus is opening like the leaves of a book; and thus exhibits an appearance in burning extremely like wood. But let the fire be applied to the middle of the bed, instead of the leaves, and we shall see a very different appearance; for here the expanded aqueous vapors, confined between the laminæ, form explosions on throwing off splinters from the kindling mass; and the coal then burns with much noise and disturbance.

STAFFORDSHIRE-COAL.

It is in general of a distinctly schistose structure; the laminæ often not more than a quarter of an inch thick. When broken transversely this structure is very distinct; and the cross fracture of the laminæ exhibits a compact texture with a lustre like that of pitch. If broken in the direction of its laminæ, the surfaces of these appear to be overspread with numerous flattened pieces of charred fibrous wood, lying in various directions. Sometimes these surfaces are continued to a considerable extent, forming an area of several square inches; and here

and there the charred appearance is incomplete, and the substance resembles those specimens of Bovey-coal, in which the vegetable character is not yet destroyed. It is especially in this respect that Staffordshire-coal differs from the varieties next to be described, to which it bears otherwise the greatest resemblance.

PITTSBURGH-COAL.

We comprehend under this name all the coal which belongs to the extensive bed of this substance, which spreads itself with very little interruption through nearly the whole country included between the western part of the Alleghany mountains on one side and the great lakes and the Mississippi on the other, and which probably will be traced hereafter to a much greater distance. It is perhaps the most extensive bed of coal to be found on the globe. Its having been first discovered, or at least employed on the most extensive scale at Pittsburgh, will justly entitle it to the name by which we have distinguished it.

It is always, as the former variety of a distinctly schistose nature, and may be separated into very thin laminæ. Its color is pure black, very seldom grayish black but more commonly of a yellow ochre color, owing to the pyritical matter with which it is often mixed. It is frequently iridescently tarnished. Its longitudinal fracture is slaty; the cross fracture is small grained uneven, passing into flat conchoidal, with a lustre like that of pitch. It breaks into angular fragments. The fibrous texture of the wood is entirely obliterated in it. It is soft and easily frangible. Its specific gravity varies in different specimens from 1, 23 to 1, 60. We have vainly attempted to obtain by analysis a general standard of its constituent parts. In some specimens taken from pits on the right bank of the Monongahela, we obtained 54 parts of charcoal, 43 of bitumen and 3 parts of earthy and metallic matter. From the coal taken from another pit on the left bank of the Monongahela, we obtained 64, 5 parts of charcoal, 33 parts of bitumen and 2, 5 parts of earth and oxyd of iron. These seem to be nearly the two extremes of the range in the proportion of its constituent principles.—The bitumen itself is partly in the state of asphaltum, that is to

say of mineral oil, which by exposure to air and consequent absorption of oxygen has acquired a considerable degree of consistence and brittleness, and partly in that of maltha or mineral oil less condensed and consequently less brittle. In proportion to the prevalence of the former, is the caking quality of the coal. The coal from which the second analysis above mentioned was taken, cakes but very little, gives a sudden and strong heat, but cannot be easily preserved for a long time.

The ashes of the Pittsburgh-coal vary considerably in point of abundance as in color. The latter is mostly grayish white, but in some instances of a brownish red color, in which case the coal is found to contain an unusually great proportion of pyritical matter, or iron combined with sulphur. The sulphur is dissipated during the combustion: the iron is oxydated to a higher degree than it was before, and hence that reddish brown color.

Some parts of the coal appear to be little more than a mass of earth or stone, generally of a schistose character, slightly penetrated, but little more than colored by the coaly matter.

We have vainly attempted to discover the cause of the iridescence of many specimens of this coal. We scraped carefully off the iridescent part and submitted it to various chemical tests without any satisfying result.

No alkali can be discovered in the ashes left after combustion. Litmus paper, reddened with vinegar is not restored by them to its primitive color, nor paper stained with tumeric changed in any manner whatever.

Vegetable remains are very seldom found in or near this coal. The only specimen of this kind that we could procure, is a reed belonging to a much larger species than is now known in this country, and in which the longitudinal striæ and transversal fissures are distinctly marked. The substance is slate penetrated by bitumen.

It is probable, that the Richmond or Virginia coal, the coal found on Rariton river in New Jersey, on the banks of the Hudson near Poughkeepsie in the state of New-York and that found in Rhode Island, belong more or less to this species of coal, but

we possess too little personal knowledge in this case to pronounce with certainty.

According to the analysis of Kirwan and of the Bishop of Landaff the Whitehaven and the Newcastle coal in England belong likewise to the same variety.

KILKENNY-COAL, OR WELSH CULM.

Its color is dark iron black, verging on slate gray. It occurs in mass, and has a bright metallic lustre. Its longitudinal fracture is slaty; its cross fracture is small, and imperfectly conchoidal. Its specific gravity is 1, 52 to 1, 83.

According to Kirwan's analysis it contains in 100 parts:

Charcoal . . .	97, 3
Ashes	2, 7
	100, 0

When laid on burning coals, it becomes red hot, emits a very light lambent flame, like charcoal, and is at length slowly consumed without caking, leaving behind a portion of red ashes.

The true Kilkenny coal is harder than Welsh culm, and of a brighter lustre; it often contains pyrites, and therefore gives a sulphureous odor when burning. This species of coal is found also in Hungary, Italy and France.

The species and varieties of this family, constitute the *Blende* or *Glanz-kohle* of Werner.

LEHIGH-COAL.

Lehigh-coal may be considered as a variety of Kilkenny-coal, as will appear from the particular account given of it by Dr. Woodhouse in Dr. Coxe's Philadelphia Medical Museum.

"This coal is found in immense quantities in Pennsylvania, in the county of Northampton, near the river Lehigh. It is of a shining black color, and stains the hands very little. Its fragments are tabular, as may be seen particularly after it has been submitted to heat. Its specific gravity is 16, 181, that of distilled water being 10. It burns with very little flame, and no smoke; is with some difficulty kindled, and requires a considerable draught of air to keep up its combustion.

"When perfectly consumed, it leaves behind a small portion of white siliceous earth, containing no potash, and sometimes colored brown, by means of iron. It does not contain any sulphur.

"A fire was kindled at half past eleven o'clock, by placing a quantity of the Lehigh coal upon a stratum of common charcoal, in a powerful air-furnace, which was then filled with equal portions of the two substances.

"As fast as the charcoal consumed, the Northampton coal was added, and at half past one, the furnace was completely filled with it, and two-thirds of it red hot. At five o'clock the coal was half consumed, and it continued burning until eleven o'clock at night.

"James River-coal submitted to an experiment of the same kind, burned out in four hours.

"A fire was made with the Lehigh coal, in a smith's forge, and two thick bars of iron were placed in it, and welded with great ease, by the proprietor of the furnace.

"The smith, his journeyman, and by-standers were convinced that the heat was much greater than that of James River-coal.

"As the Virginia coal burns with flame and much smoke, a vast portion of this combustible substance, and the heat generated by it, is lost by passing up the chimney.

"The Lehigh-coal promises to be particularly useful, when a long continued heat is necessary, as in distilling, or in evaporating large quantities of water from various substances; in the melting of metals, or in subliming of salts; in generating steam to work steam-engines; and in common life, for washing, cooking, &c. *provided the fire places are constructed in such a manner as to keep up a strong draught of air.*"

To answer the last purpose, Mr. Oliver Evans, to whom we are indebted for the most important improvements in some other parts of mechanics, contrived a particular stove, which unites the double advantage of giving out at once heat and light, and to which he has given the name of the luminous stove.*

* See on this subject the memoir of Mr. Oliver Evans *on his stove for burning Lehigh-coal,* in *Dr. Meuse's Archives of Useful Knowledge.* Vol. II, p. 291.

CULM OF PEMBROKESHIRE.

This is a species of coal, in its composition closely resembling the two foregoing: it usually occurs in a pulverised state; and is not used as fuel till it has been previously made up into balls with clay.

GENERAL OBSERVATIONS ON COAL.

It must be remarked, that the different varieties of coal before enumerated are not to be met with in a pure state, in those places where they are found: on the contrary, the different qualities and proportions of their ingredients, make a vast number of other varieties, fit for different purposes, according to the quality and quantity of those they contain. The various kinds of coal are often found mixed with each other under ground, and some of the finer sorts run, like veins, between those of the coarser. Mr. Magellan observed in the fine coals employed in a curious manufactory at Birmingham, that they produced a much clearer flame than he had ever seen produced from common coal, but, on enquiry, he found that these were picked out from the common coals of the country, through which they ran in veins, and were easily distinguished by the manufacturers, though they did not afford sufficient indications of a specific difference. The purpose to which they were applied, was the moulding of rods of transparent and colored glass, into shapes proper for common buttons, which the workmen performed with astonishing expedition.

Coal like most other considerable masses of matter found near the surface of the earth, is disposed in beds or strata, which are sometimes parallel to the horizon, but generally form different angles with respect to it; the same stratum commonly preserves the same direction. The strata of coal are disposed between strata of other matters. Brogniart, in speaking of the coal mines near Liege, says that three and twenty different strata have been there met with one below the other; and that they are incurvated in a variety of directions. The following strata are usually found in those districts of England and Scotland where coal abounds; whinstone, freestone, sandstone or free-

stone of a coarser texture, metalstone, which is a hard argillaceous substance, containing balls of iron ore, and shiver, which is the most common of them all, and is an indurated ball usually of a blackish color.

These strata do not bear on each other in the same order in different collieries, nor are they of any uniform thickness. The strata of coal themselves are divided by other partings, called *backs* and *cutters*, into innumerable cubic, prismatic and rhomboidal figures.

In all places where the strata lie regularly, they are divided and subdivided in the manner above mentioned, and sometimes extend uninterruptedly through a considerable district. This regularity, however, is frequently broken by *gaps* filled by other matter, which has evidently fallen in, in consequence of the strata having been separated from each other by some violent convulsion. The larger gaps are called *dykes*, and descend from the surface of the earth, sometimes perpendicularly, sometimes obliquely, to the greatest depths ever tried. On each side of these gaps the strata correspond, but they are often sunk several feet or fathoms lower on one side than the other, and this is called a *dip*.

The burning of coal has been supposed to contribute to the healthiness of the cities of England and Scotland, where pestilential diseases prevailed much more formerly, before the forests were carefully preserved, than since the general introduction of coal. The city of Richmond, in Virginia, has been referred to, as an example of the febrifuge operation of the smoke of coal; the febrile ailments of its inhabitants having greatly lessened since their fires were generally made of that material.—In Pittsburgh intermittents are likewise of a very rare occurrence.

Dr. Mitchell supposes that coal acts in thus keeping away diseases, by the volatile alkali it affords in combustion, destroying the acidity which, he imagines, exists in the atmosphere of cities, arising from the putrefactive processes continually going on.

We must confess, that not only we are by no means convinced, that acidity is the cause of fevers, but that we are fully

persuaded that no volatile alkali is afforded by the combustion of coal, as its presence cannot be proved by any chemical test. We are inclined to attribute the febrifuge effects arising from the combustion of pitcoal to the carbonic acid which separates in the atmosphere from the carburetted hydrogen on account of its greater specific gravity which makes it fall to the ground. That this is really the case we have frequently observed in Pittsburgh, where any tool of iron cannot be exposed in winter, and during the *moist* season, to the atmosphere, even for a few hours, without being covered with a crust of carbonate of iron, or in other words, without becoming rusty. It is known that the carbonic acid, *when mixed in convenient proportions with the atmospheric air*, will frequently operate as a healthy stimulus, and to this the salubrity of places where coal is extensively used, may probably be ascribed.

We have likewise observed that diseases of the skin are less frequent in coal countries than in others. This is probably owing to the sulphur which being volatilized during combustion, escapes into the air.

The salutary effects of the emanations from coal, however, ought not to render us indifferent to the many unpleasant consequences which arise from the excessive consumption of this fuel in manufacturing towns, such as Pittsburgh. To prevent these it will be necessary to have recourse to the ingenious methods followed in the manufacturing towns of England, for the consumption of smoke, of which the reader will find an ample detail in Prof. Cooper's Emporium, Vol. II. No. 1.

(To be continued.)

APHORISMS OF POLITICAL ECONOMY.

(*Continued from p.* 117.)

CHAPTER III.

ON THE RELATION OF POPULATION WITH THE DIFFERENT KINDS OF SUBSISTENCE.

¶ 35. If the increase of population be of such importance, we have particularly to advert to those circumstances which favor it in the mass of a nation. Two conditions are essentially necessary for this purpose, viz *procreation* and *food*. The first *gives* existence, the second *maintains* it, and the human species can multiply only in proportion to the increase of their food, whatsoever may be the rate of their procreation.

¶ 36. The *procreation* of the human species seems to be *without limits*; the *food* on the contrary, which they make use of for their maintenance *has determined limits*. As long as the procreation has not arrived at the full limit of the food that may be procured, the human species is susceptible of multiplying; but as soon as the procreation has reached the full limit of the food that may be procured, it remains stationary and ceases to be susceptible of any further multiplication.

¶ 37. The *limits* of the multiplication of the human species are of two kinds: either *physical* or *moral*. They are physical when the procreation has carried the numbers of mankind to the full proportion of the food which it is *possible* to procure; they are moral, when obstacles of any kind prevent the procreation from carrying the numbers of mankind either to the full proportion of their *actual* food or to the full proportion of the food which they *might possibly* procure. In the first case the human species is in a physical incapacity and in the second in a moral incapacity of multiplying any further.

¶ 38. By *actual food* is understood that which men are in possession of at any given moment: by *possible food* that, which it is in their power to procure beyond the quantity of their actual food.

¶ 39. Besides the division of food into actual and possible, the three following species of food may be particularly distinguished.

1. *Natural food*, being thus called, because the vegetables and animals that furnish it, are the mere work of nature, without any additional labor of man, but that of appropriating them immediately to the purpose of animal subsistence.

2. *Artificial food*, which includes all the subsistence that is the joint result of the labors of man united with the gifts of nature.

3. *Mixed food*, by which we understand, that kind of subsistence which takes place when men abandon the raising of vegetables to the care of nature and attend only to the rearing of cattle.

¶ 40. The human species presents itself scattered over the surface of the earth under three very different modes of association, which almost constitute three different species of men. The first of these classes is formed by the *hunting tribes*; the second by the nations of *shepherds*, and the third finally by the *agricultural nations*.

¶ 41. The *hunting tribes* maintain themselves by means of natural food, or in other words, they subsist on the spontaneous productions of the earth, and principally on the flesh of wild beasts. The total amount of their food depends on the number of wild beasts whose flesh forms their subsistence, and the number of the wild beasts depends on the quantity of vegetables which nature produces spontaneously for their food. Thus the population of hunting tribes depends finally on the quantity of vegetables which nature produces spontaneously for the food of wild beasts.

¶ 42. Of all the vegetables, which the earth is capable of producing, those which grow spontaneously offer the least portion of subsistence to men as well as to animals, either with respect to the quantity in which nature produces them, or in regard to the nutritive qualities which they possess; consequently, a tribe maintained on the spontaneous productions of the earth exists necessarily in the lowest degree of population

of which the human species is susceptible, and such is in fact the population of the hunting tribes.

¶ 43. The scanty subsistence which nature furnishes to these nations on a vast space of ground, obliges them necessarily to disperse themselves over the territory which they occupy, in small tribes, and to live each of them at distances proportioned to the facility of providing for their wants. This circumstance alone would be sufficient to render them incapable of developing among themselves those powers and faculties which are so necessary to the real destination of man.

¶ 44. The hunting tribes multiply naturally to the full proportion of the quantity of spontaneous productions of the earth which supplies the food of the wild beasts, on whose flesh they maintain themselves; but they are in a physical incapacity of multiplying beyond this proportion. Among these people, the excess of population beyond the means of subsistence is in the natural course of things, continually followed by destructive wars and mortality, which carry the means of subsistence beyond the actual wants of the population. The spring of procreation operating again in all its activity, the excess of subsistence over the population will be followed by a corresponding excess of the population over the means of subsistence, and thus, from age to age the mean ratio of their population will remain invariably the same.

¶ 45. The *nations of shepherds* maintain themselves by means of what we have called *mixed food*. They subsist, like the hunting tribes, on the animal kingdom, but it is especially on domesticated animals, that is to say, such animals as have been taken out, as it were, from the hands of nature, and subjected to man. These nations, consequently, leave to nature only the care of producing the vegetables, which they apply themselves to the maintenance and multiplication of their cattle.

¶ 46. The system of subsistence adopted by the nations of shepherds, is a first improvement of that which is followed by the hunting tribes. Cattle continually collected in numbers, improve the productive powers of the earth by the manure which they afford; besides their flesh, their milk and the various articles into which it may be converted, furnish a second

kind of food, which annually may be valued at two thirds of their weight; finally, they offer a kind of subsistence which is nearer at hand, and less precarious than that which is furnished by the wild beasts.

¶ 47. The advantages enjoyed by the nations of shepherds over the hunting tribes by means of the facility which they have to maintain a more considerable number of animals and to derive an additional food from their milk, carry their population to a degree infinitely superior to that of the hunting tribes, and the whole amount of this food being constantly collected and near at hand, they are not only invited but also obliged to unite their population and to fix themselves in the vicinity of their herds as the common centre of their subsistence. On that account we see these nations, though barbarous in many respects, considerably superior in their artificial wants and in their intelligence, to those of the hunting tribes.

¶ 48. The population of the nations of shepherds being circumscribed by the whole amount of the vegetables which the earth produces spontaneously for the food of animals, they are in a physical incapacity of multiplying beyond this point. But whenever the spring of procreation has carried their numbers beyond these limits, instead of giving time to nature to perform the work of destruction or employing any other destructive means to reduce their numbers, some chief will separate himself with a number of followers from the mass of the society, attack and reduce into servitude some civilized society, and leave behind him in abundance the primitive stock of the nation.

¶ 49. The *agricultural nations*, finally, maintain themselves by means of what we have called *artificial food*. They subsist on vegetables and animals, which both in some measure may be considered as the fruit of their own labor. In this state of things nature has no other task to fulfil, but to second the industry of man, who has rendered himself to a certain degree independent from her direct and exclusive influence.

¶ 50. The agricultural nations, in rearing by their labor the vegetables which are subservient to the food of man and of animals, improve and multiply them almost indefinitely. Thus, the more these nations do increase by their labor the quantity

of nutritious vegetables, the more they will multiply the stock of their subsistence and consequently their population; and they will cease to be capable of multiplying only, when on one hand they will have enriched the agriculture of the territory which they occupy with all the nutritious plants which it may be made to produce, and when on the other hand they have carried agriculture to the highest degree of perfection.

¶ 51. The agricultural nations, moreover, possess the additional advantage over hunting tribes and nations of shepherds, to be capable of creating, as it were, wheresoever they choose, their subsistence, which besides, may be transported almost to any distance. They consequently enjoy the fullest liberty to unite in societies wheresoever they find it convenient, and in as large numbers as they choose, which renders them capable of the highest degree of artificial wants and of intelligence.

¶ 52. Every nation that has once adopted the agricultural system, is from that moment compelled to multiply its subsistence, its population, its artificial wants and its intelligence, to the highest possible degree. For, as no agricultural nation could, in a moral point of view, cease voluntarily a moment to obey the impulse of their *natural* wants, and as the mere satisfaction of these wants must infallibly and directly lead them to the multiplication of their subsistence, and indirectly to that of their artificial wants and of their intelligence, it is evident, that the agricultural nations left to themselves are naturally compelled to multiply their subsistence, their population, their artificial wants and their intelligence, in a continually increasing progression.

¶ 53. But as no nation of the earth could maintain the order and the tranquillity of society, without submitting to the authority of some kind of government or other, it is clear, that in this respect the agricultural nations are liable to be counteracted in their natural propensity to multiply their subsistence, their population, their artificial wants and their intelligence.—And such has been unfortunately the fate of almost all the nations of the earth, whose governments have by every means opposed and counteracted the natural course of things.

¶ 54. Whilst the hunting tribes and the nations of shepherds present invariably the greatest uniformity in their mode of subsistence and of multiplication; the greatest diversity takes place in this respect among the agricultural nations. The absolute quantity of their subsistence does not form necessarily in all cases the measure of their population. The further increase of their numbers may be checked in the midst of a very abundant food; their population may diminish without the least diminution of their subsistence, and their numbers may become excessive long before they have reached the limit of the actual food existing in the mass of the nation. In one word, a number of obstacles, chiefly attributable to government, may place them in a moral incapacity to multiply either to the full proportion of their actual food, or else to the full proportion of their possible food, and these obstacles will consequently prevent their further progress in their artificial wants, their intelligence and their civilization.

(To be continued.)

ON NAIVETY.*

Paris, 1807.

IN common life, in literature and in the fine arts, we love and we admire *naivety*. The man of the world, the poet, the painter and the musician, who know how to make a convenient use of this fruitful source of agreeable sensations, are almost always certain to cause to vibrate the most tender and the most delicate fibres of our heart. Naivety is nothing else but simplicity and good nature *united to a kind of contrast*. In some instances this contrast consists in the profoundness of an idea compared with the extreme simplicity of its form, as in the

* This essay was published in 1809 in *the Hemisphere*, a French periodical paper, printed in Philadelphia. It is republished here because the word *naivety* has recently acquired citizenship in the English language, whilst its real meaning is by no means universally understood.

answer of the beggar who was reproved for keeping a dog: "Ah, who will love me!" But more frequently naivety is produced by the contrast which exists between an idea and the person who utters it, as when children drop sentences and truths which commonly are only the fruit of experience and a certain combination of ideas, or else when people of a mature age make confessions, which we are by no means prepared to expect from their knowledge of the world and which commonly escape only from the lips of infantine innocence. Sometimes naivety is art with all the appearance of nature; at other times it is nature with all the appearance of art. But in every case naivety always results essentially from *simplicity united to a kind of contrast.*

Naivety belongs to the mind as well as to the heart. See Aristus! a series of misfortunes has plunged him into a state of obscurity. He wants friends and protectors. Yet the natural frankness and naivety of his character have the sway over his mind. He does not mean to attack, but he wounds the feelings of others, because he speaks truth almost without thinking of it. He will wound frequently, for the follies of men are many, and his mind is upright. Neither the presumption of a decorated upstart, nor even the fear of bayonets can prevent him from exposing an error, from making war upon prejudice, or from reinstating the truth and the integrity of a fact. Every one may easily know his friends and his enemies. He will speak to you of the good qualities, which he thinks he possesses, with the same frankness, with which he will confess his own faults, but in doing so, he means neither to puff himself up, nor to detract from the merits of others. He never thinks differently from what he expresses, but he almost always expresses more than he means to say. In all this, Aristus follows only the natural impulse of a character truly endowed with naivety. This, indeed, is not the turn of mind which is necessary to succeed in the world; but the friends of truth, of simplicity and of nature, will always be the friends of Aristus.

Florval arrives at Paris from the remote corner of a province. He has never seen a large city. He is ignorant of all those studied airs, of all those grimaces of benevolence and good-

ness, by which highly civilized men endeavor to deceive one another, though they seldom succeed in doing so. No dancing master has taught him, to present himself with grace, nor a teacher of eloquence how to speak gibberish without any sense. But Florval will please every good and candid mind.—His countenance as well as his manners bespeak the naivety of his heart. He will never make you long protestations of friendship, but, without uttering a word, he will press warmly your hand. When speaking of a friend, whom death has snatched from him, he will tell you perhaps with good Montaigne,* "*he was I, I was he.*" The least suspicion of trumpery and false-

* *Michel de Montaigne*, a French nobleman, who flourished in the beginning of the 16th century, was one of the most distinguished literary characters of his age. His *philosophical Essays* are a work, which in point of originality of thought, in the number and variety of observations on men and manners, and in the display of the most intimate acquaintance with the writings of the ancients, stands perhaps entirely unparalleled. As a metaphysician, Montaigne distinguished himself as the great restorer of the *sceptic school*, which, since the time of Sextus Empiricus, had not found an equally skilful supporter; and this superiority he yielded only long after to the more subtle dialectick of David Hume. He has a *manner* of his own, which gives a peculiar charm to his writings. The reader almost forgets that he is perusing a book. The familiar, loosely connected, and frequently diffuse, yet always interesting talkativeness, of Montaigne, is more like the free and unguarded conversation of a friend, than like the buckram stiffness of a work destined for the public; and if any thing was yet wanting to complete the illusion, it is the extreme *naivety* with which the author speaks so often of himself, displaying without reserve his pretensions, as well as his foibles. A great deal of this *naivety* results likewise from his antiquated style, which, though inferior in neatness and chaste elegance to the modern French, surpasses it by far in energy and simple nature. In the last instance, it is especially the *contrast* between the modern and old French which produces the sentiment of naivety, in the same manner as the rural habits of a Swiss family will appear as possessed of naivety only in the eyes of one who has resided in large cities.—If we recollect well an English translation of Montaigne was promised some years ago by Mr. Johnes the translator of Froissard and some other French memoir writers, but we are ignorant whether this translation has ever been published.

hood will be far from him. It is on that account too, that honest Florval scarcely makes a step at Paris, without being the dupe of rogues and of intriguers.

If you have ever travelled in Switzerland, if you have ever entered one of those cottages which are scattered over the declivity of the mountains, you may have enjoyed the spectacle of a truly patriarchal simplicity. A venerable octogenary was seen surrounded with his numerous descendants, all united by the ties of the most intimate fraternity. You were invited without ceremony to take part of a frugal repast. Some milk, some cheese, black rye-bread, and some fruits of the season formed all its delicacies. The dishes all of wood were yet shining with neatness. A table of walnut with chiselled feet, seemed to have been transmitted through a long series of generations. A set of wooden chairs was ornamented with rude carvings; one single arm-chair with a high leathern back was reserved for the head of the family, and formed together with an enormous cupboard the richest furniture of the piece. No one of the company imagined, that the petticoat rather somewhat too short, of a young girl of sixteen years of age, could give occasion to any indecorous observations. The gayety of the circle that surrounded you, was neither boisterous nor affected, and when you were taking leave from your new friends, you were earnestly and warmly pressed to return as soon as possible. Thus, naivety was to be seen every where, in the mind, in the manners, and even in the very furniture of the house.

When I am speaking of the naivety of the mind and of the heart, how could I forget thee, soft and tender Heloisa, thee, whom nature seemed to have framed out of her purest and most celestial elements. How could I forget the moment, when the mild blushes of thy virginal countenance, and some words of naivety that dropt almost unconsciously from thy lips, discovered sentiments which thou felt for the first time! No, no; this enchanting remembrance will never leave me, though thy charms and thy virtues are now shrouded in the cold tomb!

The appearance of naivety may be sometimes affected, but rarely is it affected to advantage. Cephissa is composing every morning before her mirror the expression of innocent nai-

vety; she meditates beforehand the simple and candid expressions by which she means to captivate the hearts of her admirers. See how negligently her shawl is cast over her shoulder, how the locks of her hair are tortured to represent simple nature! But all the art of Cephisa is of no avail to conceal her devices and her experience.

There is another more happy imitation of naivety in literature and in the fine arts, but it belongs only to the man of genius to use it with success. The exquisite susceptibility, which characterizes the real poet, and the real artist, renders them capable of receiving any impression so undiminished and so entire, that they identify themselves in some measure with the subjects which they are treating, and this to such a degree that their expression becomes the pure accent of nature. This certainly is the greatest triumph of art!—The world of Lafontaine* is not for him a fictitious world. Under the influence of the illusions created by an inflamed imagination he takes the most lively interest in the fate of his dear animals, the heroes of his poetry. When my mind is clouded with griefs, when gnawing cares overwhelm my breast, may I be at least permitted to read one page of the immortal fabulist, and peace will return to my mind, I will be reconciled with myself, with my enemies, with the whole world.

The art of painting knows likewise how to fix on the canvass that amiable disposition of the mind and of the character which constitutes naivety. You who have admired the creations of the pencil of Raphael, can you doubt of it? What sublime naivety is impressed on the physiognomy of his little Jesuses! In them I perceive at once the candor and the innocence of childhood blended with the awful expression of grandeur, which denotes the divine character. But what words can describe that mysterious feeling, which at the first glance

* The fables of Lafontaine, the greatest fabulist who ever existed, have never been nor will ever be translated into English. It would baffle every attempt to express in any other language the charming *naivety*, which constitutes the most prominent feature of this writer. There is nothing analogous to it in any of the English fabulists.

of the spectator takes hold of his heart and tells him, "The child that you see is a god!"

Of all the imitative arts, music is undoubtedly the most limited in the means of pourtraying the objects of nature or the affections of the heart with any degree of clearness and precision. But when associated with her sister poetry, she is capable of painting all the accents of nature with a truth and an energy, which take the mastery of all our sensations and subdues even our most violent passions. She too spoke the moving language of naivety under the enchanting pen of Rousseau, that celebrated martyr of an exalted imagination. His *Devin du village** will never become antiquated, and after the lapse of ages this work of genius will yet transport the man endowed with sensibility, into the Arcadian fields of rural simplicity, and of pure and innocent love.

The enjoyments which naivety is capable of imparting, are not equally the lot of all men. Nothing but an understanding cultivated by meditation, and a heart animated with the love of moral beauty, can render us capable of being open to them. The man gifted with these qualities, perceives with heart-felt pain, the many obstacles which a *false* civilization, the prejudices of the ones and the passions of the others are daily opposing to the free display of our most natural sentiments, and of our most praise-worthy actions. He spurns at a chain which his more great and more noble mind endeavors vainly to break, and every thing that can transport him, in idea at least, was it only

* The *Devin du village* or *village conjurer* of Rousseau is an Opera in two acts, in which the most perfect simplicity of plan, the picture of the most simple manners and the greatest simplicity of a tender and melodious composition, conspire to produce the undivided effect of naivety. At a time, when musical tricks, calculated to dazzle and to astonish by novelty, and conquered difficulties, are commonly preferred to the pure accents of nature, and when the softer tunes of melody are almost exploded by a brilliant and often tumultuous harmony, the more cultivated public of Paris is still pleased with hearing this beautiful little performance. Some romances and songs of the celebrated author of Heloisa and of Emilius are written in the same spirit, both in point of poetry and of musical composition.

for a few moments, into a better world, where simplicity, frankness, candor and ingenuity have established their empire, produces in him a sweet and consoling illusion, whose too fast fading image he would wish to be capable of retaining.—It is just, that Providence, in her infinite bounty, should have reserved particular enjoyments for those who, by their organization and by their moral habits, are exposed to feel more poignantly the evils of life.

REVIEW.

An answer to Mr. Jefferson's justification of his conduct in the case of the New Orleans Batture, by Edward Livingston, esq. Philadelphia, 1813. 8vo. pp. 187.

THE human species are so strangely quarrelsome, that a grave philosopher has strenuously supported the opinion, that the primitive state of society before the establishment of laws and government was a perpetual warfare of every-one against all.* And indeed, if we advert to the present state of society around us, we might almost be inclined to admit of this misanthropical principle, little consoling as it is, either in point of the present interests, or in that of the future prospects of mankind. Not only do we see kindred nations engaged in a bloody, and sometimes barbarous, strife, but in the very heart of our *civilized* societies there is no end to quarrelling. Thanks to this amiable disposition of our race, we are blessed with a host of courts, judges, lawyers and attorneys, whose friendly endeavors are daily increasing litigation in a geometrical progression with the increase of their own numbers. Some few dollars, a little bit of land, or a box on the ear, will cause the halls of our court-

* *Bellum omnium contra omnes*, the famous maxim supported by Hobbes in his book *de cive*.

houses to resound with the din of the wordy war, which will frequently terminate in the mutual ruin of the contending parties. The best that the wise man can do under these circumstances, is to stop his ears, not to be stunned by the empty noise of the combatants, or perhaps by that of their clamorous defenders, and to let the parties terminate their mighty quarrels as they can, with the help of Blackstone, lord Coke, and all the other learned commentators of the British law.

But the case stands somewhat differently, when the first magistrate of a commonwealth infringes upon the laws and constitution of his country by violating private property, and when notwithstanding all the efforts of the injured party to obtain redress, this violation is still supported in spite of every principle of justice. In such a case, not only the feelings, but the very interests of every citizen are loudly called upon, to enter into the merits of the transaction, and to examine whether at one period or another, the fate of the injured individual may not be his fate. We do not pretend to decide that such a violation has been really committed in the case before us; but this at least is the point of view under which it has been forcibly represented by Mr. Livingston, a man whose honor, integrity and moral principles, cannot be questioned, and these ought to be for the public sufficient motives to lend an attentive ear to his defence. "Causes of less importance" says Mr. Livingston himself, "have sometimes excited an interest, not only in the countries where they originated, but abroad. The despotic king of Prussia could not oppress one of his subjects under the forms of law, without exciting the indignation of Europe. Lawyers of the greatest eminence took cognizance of the affair, and the force of public opinion, even in a military monarchy, obliged the prince to do justice to his vassal."

We shall endeavor to give our readers a brief and condensated statement of the most material facts.

The Mississippi flows through a country evidently gained from the sea, for about one hundred and fifty miles from its mouth. As in all lands formed wholly by the deposit of rivers, which overflow, the ground is highest near the banks, and slopes

in an inclined plane to the level of the waters which receive those of the river, terminating here at irregular distances, in cypress swamps or trembling prairies. The surface of the water, when it is not swelled by the rains and dissolving snows above, is at New Orleans about nine feet below the natural bank. When swelled to its greatest height, it rises about five feet above the level of the bank, and would of course overflow the whole, unless dykes, there called *levees*, were raised to confine it.

The Mississippi is a deep, rapid, meandering and turbid river. From these characters it results, that when it flows, as it generally does through a light soil, it makes frequent encroachments on the one bank; and wherever the waters become stagnant, behind a point, or at the edge of an eddy, leaves a deposit on the other. Should this deposit be made in the middle of the river, it forms a sand-bank, and when it arises above the surface of the water, at its natural height, an island. But if the deposit be made, as it generally is, adjacent to the bank, it then becomes, what is called in the country, a *batture* or alluvion. These battures, low at first, gradually rise, by successive deposits, above the surface of the water at its *natural* height, and when they are increased, so as to leave not more than five or six feet water upon them at the time of the inundation—that is to say, when they attain the height or nearly the height of the natural bank, the proprietor of the land in front of which they are formed, generally raises a new embankment or levee, so as to include the soil thus created, and protect it from the inundation. The land thus gained, becomes incorporated with the original plantation; the old embankment is suffered to decay, and the road is generally removed, so as to continue along the course of the new levee.

The land in dispute is of the kind here described, and is designated in the grant under which it is held as thirty-two arpents *de face sur le fleure St. Lewis* [front to the river Mississippi.] It was acquired by the order of Jesuits in three different purchases. When in the year 1763, this order was abolished in France, all its estates were forfeited to the crown. The thirty-two arpents above mentioned, forming part of it, were

divided into six lots, and sold at auction by the same usual description, *so many acres front.* The part of this land adjoining the city was purchased by persons from whom it passed, by regular conveyance, to Bertrand Gravier, who cultivated it as a plantation. In the year 1788, Bertrand Gravier divided the front part, lying within the road, into two ranges of lots; in 1796 he enlarged the plan by adding three other streets in the rear, and at different times sold all the front and some of the rear lots to purchasers.

In the year 1803, John Gravier (then become the proprietor) made an enclosure of about five hundred feet square on the batture. Prior to this, he does not appear to have interfered with a practice which the citizens of New Orleans had been in, of digging sand and earth from it. The property, however, was now becoming valuable, both from its gradual accession of height and extent, and from the growth of the town in its vicinity. Finding that the city and its inhabitants claimed as a right what he and his ancestors had only suffered from inattention, John Gravier determined to bring the pretensions of the city to a legal test. He commenced a suit for the purpose of being confirmed in his possession, and to prevent the city from troubling him with their groundless claims. This suit was pending for near two years; it was heard at three different times, and at length, by the unanimous opinion of the court, decided in favor of the plaintiff. Immediately after the judgment, it was, however, discovered by the corporation, that they had been defending a false claim. Their counsel moved for a new trial, on the ground that the title was in the United States. Most of the arguments since addressed to the public to prove the position, were urged in the court, but without success; the judgment was confirmed in the month of June 1807.

Mr. Livingston, one of Gravier's vendees, beginning to improve the property, was for some time impeded by a tumultuous assemblage of people, who, however, did not long continue to oppose violence to the laws. He was suffered to proceed, and after he had expended upwards of thirteen thousand dollars in improvements, and a much larger sum in new purchases, a mandate arrived from Washington, in Jan. 1808 ordering the

marshal of the district to dispossess him by force. Upon this, Mr. Livingston presented a petition to the superior court, and prayed their interference to prevent the execution of this illegal order; it was granted, and injunction was delivered to the marshal, commanding him to desist from the execution of the mandate. This writ was, however, disregarded, an armed force was collected, and the proprietor was forced to abandon his possessions, and from that time to the present, he has been employed in ineffectual attempts to obtain relief.—We will hear Mr. Livingston's energetic and eloquent language on the subject.

"An individual holding a tract of land under one whose title had been acknowledged, and whose possessions had been confirmed by a court of competent authority, is violently dispossessed by the orders of the president of the United States, without any of the forms of law and in violation of the most sacred provisions of the constitution; the ruined sufferer seeks redress, first by expostulation;—he offers to submit to the decision of indifferent men, and he is refused;—he offers to abide by the sentence of men chosen by the president, and he is refused:—he offers in the simplicity of his heart, to acquiesce in the opinion even of the president himself—and he is refused.—He is not even permitted to exhibit his proofs. Fearing the conviction they would produce, he is told, that though the president could take, he cannot restore; that he can injure, but cannot redress; and that congress alone are competent to grant him relief. To congress, then, he applies;—here the same baleful influence prevails. After two voyages of three thousand miles each, after two years of painful suspense and humiliating solicitation, after an attendance of three sessions, he finds that no means can be devised for his relief, that the friends of that man who "*wishes for a full investigation of the merits at the bar,*" defeat every plan for bringing the cause before a court, vote against every law providing for a trial, and effectually as *they* think and *he* hopes, bar all access to any tribunal where the dreaded merits of the case would be shown.—Harassed but not dispirited, the injured party finding that no legislative aid can be expected to restore his property, at length applies by suit for a compensation in damages;—he appeals to the laws of his country, and is willing to abide the decision of a jury, in a country where long residence, great wealth, the influence which had been created by office, and a coincidence of political opinion gave every advantage to his opponent.—Here then is an opportunity which a man desirous of open investigation will not neglect. The upright officer, who has been unjustly accused of oppression, will justify himself to his country, and cover his accuser with confusion. The vigi-

lant guardian of the public rights will defend them before an enlightened tribunal, and expose the rapacity of the intruder. He who "stands conscious and erect" will rejoice in the investigation of his innocence, he will discard every form, and proudly dare his adversary to a discussion of the merits."

"But the man I speak of does not do this—the man I speak of did not dare do this.—He feared the learned integrity of a court; he feared the honest independence of a jury. He entrenched himself in demurrers, sneaked behind a paltry plea to the jurisdiction, and now publishes to the world, that he is *precluded* from this mode of justification, and that "his wish had been for a full investigation of the MERITS at the BAR."

Mr. Livingston in his reply to Mr. Jefferson's publication, endeavors first to repel what he calls his skirmishing attacks. He establishes his title to the batture by shewing, that the principal ground on which Mr. Jefferson denies it, rests evidently on the mistranslation of a Spanish document in which the word *todos*, *all*, is omitted; and that the relations of Gravier had fully confirmed it. The reproach that he had stirred up a dormant claim is likewise proved to be unfounded. Having dismissed these previous questions he answers the objection of Mr. J. that the judgment in favor of Mr. Livingston did not bind the United States, who were not parties in the suit, by remarking, that the U. S. were really bound, because they claim as trustees of the corporation and not for their own use. The grounds on which Mr. J. proceeded to seize the batture are next examined. Mr. J. alleges, that Mr. L. being much disliked by the people of New Orleans, the judgment of the court proved to be very unpopular, that it was generally supposed, that his works would drown the city, that the people on that account was in the highest state of commotion, and that under these threatening circumstances, there was no time to wait for the slow forms of law. Mr. Livingston calls in to his aid mathematical calculations to prove that his works could by no means be detrimental to the city. He establishes, that the batture was formed long before his works, or any others, were thought of in that place.

"Its progress," says he, "has neither been hastened nor retarded by any thing that has been erected there. The puny works of man can

neither arrest nor hasten the progress of those changes which are produced by natural causes, impelling this mighty mass of waters. An attentive observer may perceive these causes, but as yet, no human effort has been able to prevent their effects. The river, on an average, is twenty fathoms deep. The weight of this prodigious column of water, borne with a current of two miles an hour against a loose soil, undermines it at a depth which no piles can reach; and whole fields are sometimes precipitated at once into this abyss. When these excavations take place on a point, the batture formed by the eddy below it, becomes itself exposed to the depredations of the current. In the mean time new eddies are formed; they become the agents of new deposits, and places which only a few years before were covered with twenty fathoms of water, begin to shew their heads above the stream."

We have inserted this passage, because in a geological respect it is by no means uninteresting; but we return to Mr. Livingston's reasoning. He thinks, that local laws are quite sufficient to prevent and local authorities to abate nuisances, and that at any rate Mr. J. is not high Constable of New Orleans. He objects to the preference given in Mr. J's cabinet council to the French laws over the Spanish in the decision of this case, because, though both appear to be favorable to Mr. L's cause, the former afforded quibbles, of which advantage might be taken against him. That these obscurities of the French jurisprudence proceeded from the inaccurate expressions of some French jurists, and the grasping provisions of some French edicts, had been formerly sufficiently shewn, particularly in two publications of Mr. Duponceau of Philadelphia, a man whose general erudition, legal knowledge and brilliancy of wit, are universally known. We are now introduced into that part of the discussion, where Mr. Livingston replies to the heavy artillery of Mr. J. but of which the limits of our pages will permit us to give only a superficial sketch. The *first* argument of Mr. J. viz. that the batture is an alluvion, and as such belongs to the United States in right of the kings of France, is in our opinion, answered in the most triumphant manner. It is shewn, that the law of France adopts the rule of the civil law which gives the alluvions of navigable rivers to the owners of the adjacent estates. Of five French authors quoted by Mr. J. in support of the opposite doctrine, one alone, appears to support it, and not very clearly. Mr. Livingston observes on this

occasion, that these authors "are made to favor it only by that "ingenious and novel device which makes the scriptures de-"clare, "there is no God." An edict of Lewis XIV, which according to Mr. J. puts an end to the question, is proved to have been misconstrued. It did not change the ancient law of France, nor give alluvions to the king. That this was really the case, is evident, not only from the concurring testimony of a number of the most distinguished French lawyers, but also from the provisions sanctioned by the Code Napolean; and it is remarkable, that the different tribunals of France consulted by Bonaparte on the new code, acknowledge its dispositions respecting alluvions as having been anciently established. A number of facts laid down in the decisions of the French Tribunals fully corroborate this doctrine. Lewis XVI, who had issued an edict claiming the alluvions of certain rivers in Guyenne, was firmly opposed in this violation of private property by the parliament of that province, and finally yielded to their reiterated remonstrances. Mr. Livingston, after having quoted the spirited language of the French attorney-general on this occasion, makes the following remarks:

"I must interrupt my extract; it affords too painful a contrast between the minister of an absolute monarch, and the representatives, the magistrates of a free people. In France, the victim of oppression found a defender in the creature of the monarch who wronged him; he was reminded, that a *French parliament* would never cease to defend his rights, and that the *authority* of the magistrate would shield him from violence. He was told this, and it was not a vain boast. Royalty itself respected his possessions, it bowed to the majesty of the law; and after an ineffectual struggle gave up the contest. While here the free citizen of a free and enlightened republic, is despoiled of the *same species of property*, claimed under cover of the *same laws*, by military violence; and he finds no parliament to remonstrate, no magistrate to defend him;—he is denied even a hearing; and the first officer of a republic succeeding to the claims of a *French monarch*, is permitted to enforce them in a manner, and to an extent, which the king could never dare, in the plenitude of his power to do."

Mr. Jefferson's *second* point, that alluvions by the civil law, accrue only to rural, not to urban possessions, is despatched in a few pages. Numerous texts from the civil law prove unequivocally that the right of alluvion accrues to city-property, as

well as to fields. The learned distinctions of Mr. J. are irreverently treated with poignant sarcasm, and Mr. L. terminates this part of the discussion with observing, that Mr. J's principle, even if it were correct, could not be applied to his property, as according to Mr. J's own statement, the batture existed before the lands adjacent to it were converted into a suburb.

In his *third* point Mr. J. had attempted to prove, that the batture is not an alluvion, but part of the bed of the river. It is not an alluvion, says Mr. J. first, because the accession by alluvion must be *insensible*, and the increase of the batture may be perceived after every swell of six months. Mr. L. shews this to be a ridiculous argument, supported by the false interpretation of a Latin word. We shall give the second argument of Mr. J. in Mr. Livingston's own words:

It is secondly, no alluvion, because alluvion is created by "apposition of particles of earth;" but the batture has been created by *deposition*. Now the reader who wants to find this word in any of the definitions, either Latin, Greek, French, English or any other language, will be disappointed. It is created by a curious process, which is highly instructive. The original Latin is *incrementum latens;* here we find nothing about *apposition;* but this, we are told has been translated by Theophilus into Greek, and that he calls it "*Prosklusis* and *Prosthosis*," which *prosklusis* and *proschosis* are brought back again into Latin by Curtius, under the names of *adundatio* and *ad aggeratio*. Here you see we have got *incrementum latens*, thanks to Theophilus and Curtius! back again into Latin; but so changed, that the father of the phrase himself would hardly know his child. But this is not all, the unfortunate word is not yet released from the torturing hands of these magicians; after the Latin comes the American conjurer—another metamorphosis is to be made; he creates two potent words for the purpose, and presents us with *adundation* and *ad-aggeration:* but as all his readers might not understand this new vocabulary, he changes *ad* into *ap*, *unda* into *posi*, and *adundation* becomes *apposition;* and thus *incrementum latens* having gone through the hands of Theophilus, Curtius and Jefferson, comes out, "*apposition of particles of earth*." I am deceived if there was ever a more ingenious process; a troublesome word in a definition or a text, may, by the aid of a few translations and re-translations, be made to mean any thing we please."

To illustrate by another example the happiness of these successive translations and re-translations, Mr. L. relates in a note the following ludicrous anecdote.

"An unfortunate Scotchman, whose name was Feyerston, was obliged, in pursuit of fortune, to settle among some Germans in the western part of New York. They made a much better *proschesis* than Theophilus did; they translated him *literally* into German, and called him *Feuerstein*. On his return to an English neighborhood, his new acquaintances discovered, that *Feuerstein* in German meant *Flint* in English. They re-translated instead of restoring his name, and the descendants of *Feyerston* go by the name of *Flint* to this day. I ought however to except one of his grand-sons, who settled at the Acadian coast, on the Mississippi, whose name underwent the fate of the rest of the family: he was called by a literal translation into French, "*Pierre a fusil;*" and his eldest son returning to his family clan, underwent another *prosklusis*, and was called *Peter Gun.*"

The *third* argument by which Mr. J. means to support his position, that the batture is no alluvion, rests on the interesting observation of the late president, that it is not *plastered* against the adjacent field, nor *arable* like it—an argument which Mr. L. does not think worthy of a very serious refutation. If the batture is no alluvion, it may be asked, what is it then finally? Mr. Jefferson affirms, that it is part of the bed or bottom of the river. Learned etymologies from all languages, Anglo-Saxon, French, Spanish, Italian, are put to contribution in support of this extraordinary discovery, and afford an amusing proof, that an etymologist may make out any derivation as he chooses.—Mr. L. shews, however, that even the *bed* of a river is only public property when covered with water, and that by the civil law, there is no public property in the soil so covered, but only a public use. The same takes place in the Spanish law, and by the French law, the *beach*, or the space which lies between high and low water, is private property. Mr. J's arguments, taken together, would go to prove that there cannot exist such a thing as alluvion. The Spanish definition of the *bank* of a river, includes the space between high and low water mark; but this definition Mr. J. purposely chose to mistranslate.—The authorities from the French and the civil law, afford room for a quibble, by saying that the banks of a river extend to the water's edge, when the waters are at their *greatest height*. Mr. J. thereupon argues that the waters of the Mississippi, are only at their greatest height during the annual period of *inunda-*

tion, and as some of the authorities use the words "*highest tides*," he contends, that the overflowings of the Mississippi are *tides*. From all this chain of reasoning it should seem to follow, that the Mississippi has no *banks*, and that all that it covers in the time of inundation, where not restrained by dykes, is part of its *bed*, and as Mr. J. himself, is aware of the absurdity of this proposition, he endeavors to escape from it, by saying, that it is of no consequence, as the lands are not yet inhabited or reclaimed. The resemblance between the Mississippi and the Nile has been frequently stated by several writers. Mr. J. insists upon this resemblance, to force into his service the laws enacted by the Romans concerning the latter river. But these very laws, quoted by Mr. L. lay down in the clearest terms, that what the waters of a river cover in the time of inundation, is no part of its *bed*. Mr. L. grants, that the public have a right to the use of the bed and banks of a river, for certain purposes, and that the owner of the soil has no right to erect works so as to impede that use. But no previous permission of the magistracy is required, nor can erections be prevented, unless complaint is made, and then only security is required from the owner that he will not obstruct the public use. The law of the territory of Orleans requiring the assent of a riparian jury before an owner of batture-land can advance his levee, was made subsequent to Mr. L's dispossession, and therefore Mr. J. blames him unjustly for not having obtained that assent. And Mr. J. adds insult to injury, when he says, that Mr. L. might have obtained such assent, the batture was seized as the property of the U. S. and no legal authority could or would interfere with the alleged title.

Mr. L. comes finally to treat of Mr. J's *fourth* head of defence, that the use which Mr. L. made of the batture, was dangerous and inconsistent with the laws of the territory—To this assertion Mr. L. gives a formal denial. His works were presented to a grand jury as a nuisance, and the presentment was not followed up. It is not the business of a president of the U. S. to watch over the police of rivers and abate nuisances. These matters belong to the local government and its subordinate authorities. But let it be admitted, that the presi-

dent had a right to remove the nuisance, in that case he has not done so, he has only removed Mr. L. from the possession of the batture. When Mr. J. indulges in violent declamations, and speaks in a pathetic strain of pestilence, fever, death, ruin and inundation, he can scarcely be serious. His real motive was to excite prejudices against the sufferer, and to catch popularity. Of this there can be but little doubt, when Mr. J. concludes *charitably*, that Mr. L. deserved to be *committed to the flames*. But we will give the words of the original:

"What was to be done," says Mr. J. "with such an offender? Shall we answer in the words of the imperial edict?—*Let him be consumed* WITH FLAMES IN THAT SPOT *in which he violated the remnants of antiquity and the safety of the empire, let his accessaries and accomplices be cut off, &c.* "Our horror," he adds, "is not the less, because our laws are more lenient."—I ought perhaps to laugh at the folly of this rhapsody, and remind the author that the flames were proposed by the Roman law, for the *destroyers* of the dykes of the Nile, not for the one who erected them.—I ought to ask him good-naturedly to look at the title of his own law* and determine which of us deserved the stake—But I confess, that the mirth naturally excited by the absurdity, is somewhat repressed by horror at the wickedness of the attempt."

The paragraph which follows next in Mr. L's memoir is not less remarkable:

"On these facts and on this law, the late president says, "*We* were called and repeatedly called to decide." As I do not suppose a republican magistrate could assume the ridiculous expression of royalty by speaking in the plural number, I must suppose, that he has fallen into it by the various capacities in which he was thus *urgently called* to act. As LEGISLATOR, he was to make a new law to fit the circumstances of the case; as JUDGE, he was to apply it to these facts, which as a JUROR, he was to ascertain, and to pronounce that sentence which, as EXECUTIVE OFFICER, he was to carry himself into effect; as PRESIDENT, he was to reclaim the lands of the U. S. as COMMANDER IN CHIEF of the armies, a sufficient *military force* was to be prepared to overawe opposition; as MAYOR of the city of New Orleans, he was to enforce its rights against the decrees of the court; as HIGH CONSTABLE, he was to abate nuisances, and as STREET-COMMISSIONER to remove the *putrifying* mass, that threatened the health of the city. We ought not to be astonished, that an officer who thought himself obliged to act in all

* De Nili aggeribus non rumpendis.

these capacities, should speak as if he were more than one, and that having in this instance invested himself with all the characteristics of despotism, he should have assumed its style.

Mr. L. proceeds now to consider Mr. J's measures in a remedial point of view, and this new discussion is conducted by him with the sagacity and strength of reasoning which characterize the former part of the publication. We regret sincerely that we cannot follow him in the many details connected with a question of such a complicated nature. For the *general reader*, however, we shall select one more passage, in which Mr. L. paints the sufferings which he endured, when he had recourse to the only means which Mr. J. had pointed out to him for redress, viz. an application to congress:

"I sought for redress from the legislature; I found there some friends: my cause had able and zealous defenders. It was considered, as it really is, not only a grievous oppression to an individual, but an alarming stretch of power, which, if unnoticed, would grow into a destructive precedent. Notwithstanding all this, I was kept from my family and my means of subsistence, soliciting relief, for more than two years. During all this time I could not obtain even a hearing.—All I solicited was some mode of trial, some tribunal to which I might apply for redress. One plan after another was formed, debated and rejected for another which shared the same fate. Every fair and honorable means of solicitation was resorted to, every thing that I thought could excite the interest which my case merited—flattered with hopes to day—cast down with despondence on the morrow, I felt, during all that period, the miseries of a life spent in solicitation and dependence."

To this pathetic description of his situation, he subjoins in a note the following not less pathetic lines, whose truth must be felt by all those who have been exposed to the agonizing fluctuations between hope and despondency:

"Ah! little knowest thou, who hast not try'd,
What hell it is, in suing long to bide,
To lose good days that might be better spent,
To pass long nights in pensive discontent,
To speed to day, to be put back to-morrow,
To feed on hope, to pine with fear and sorrow;
To fret thy soul with crosses and with care,
To eat thy heart through comfortless despair;
To fawn, to crouch, to wait, to ride, to run,
To spend, to give, to want, to be undone!

Unhappy night! such hard fate doom'd to try;
That curse God send unto mine enemy"——SPENCER.

To resume our opinion of Mr. Livingston's memoir. If an extensive knowledge of the laws of various nations, and a sound and severe logic, if violent though dignified invective, keen satire, poignant irony and a style equally pure and energetic, can bestow any merit upon a performance of this kind, Mr. Livingston's possesses it in the highest degree. Mr. Jefferson's apology for his conduct, such as it is stated by Mr. Livingston—and we have no reason to doubt, but that it is stated correctly—cannot stand against his superior weapons. But after all, we acknowledge, that we have not seen Mr. Jefferson's pamphlet, and before we presume to give our final opinion upon the subject, we shall not forget the eternal maxim of justice and equity——*audiatur et altera pars!*

MISCELLANIES.

IMPROVEMENTS IN TURNPIKE ROADS.

AT a time when the increase of population, of industry, and of commerce, in the western country, calls imperiously our attention to the making of good roads, any idea offered to the public for their improvement, may deserve a place in our pages. It is in this persuasion that we presume to present our readers with the following hints:

The best roads are those which are watered by a natural stream; they are always distinguished by a hard bottom, are never cut up, and seldom or ever require repair.

The reason of this is, that the argillaceous or clayey part is dissolved by the stream, and carried off as fast as it may accumulate, and that the stony particles and substances remain, or in other words, that matter, which spoils and ruins a road, is washed away, and that is only left, which forms its true basis.

To accomplish this, every road should fall laterally, and be concave transversely; streams of water should be turned upon them from time to time, so as to fill the ruts, and carry off the

argillaceous or clayey matter. These streams might generally be produced from springs, as it might be done for instance with great facility, on the road projected between Pittsburgh and the Two-Mile-Run, or in places where this could not be equally well accomplished, water might be accumulated in reservoirs by the road side.

DESCRIPTION OF THE WATER-BLOWING MACHINE.

The means of forcing air with great velocity into a furnace, have been lately considerably increased in number and improved in quality. Most of these improvements, however, are more or less complicated and expensive. It may rather appear a matter of astonishment, that a very simple machine of this kind, which has been pretty generally adopted on the continent of Europe for more than a century, does not seem to have come as yet into use in this country. A current of water is made to pass through a kind of cylinder placed in the open air, and perforated with a number of triangular holes. The water descends through these apertures in many small streams, and by exposing a great surface to the atmosphere, it drags along with it an immense quantity of air, and is conveyed through a tube till it dashes against a stone-pedestal inclosed in a large vessel. The mixture of air and water which falls upon the pedestal is dispersed in every direction; the air is separated from the water; it ascends to the upper part of the vessel, and rushes through a pipe to the furnace, while the water descends through apertures at the bottom of the vessel. The machine when well constructed will have as much power as can be produced by bellows ten or twelve feet long.

It was formerly imagined, that the wind is occasioned by the decomposition of the water or its transformation into gas, in consequence of the agitation and percussion of its parts; but it is satisfactorily proved, that this opinion is erroneous, and that the wind is supplied from the atmosphere; for, when the lateral openings are shut, no wind is generated.

Hence, the principal object in the construction of these machines is, to combine as much air as possible with the descend-

ing current. It is evident, that the machine can be used only in such places, where a fall of water can be commanded.

OBSERVATIONS ON LONGEVITY.

In our last Number we mentioned a very remarkable instance of old age in a man from the District of Maine. It appears, that notwithstanding the progress of luxury and corruption in nearly every part of the civilized world, instances of old age are rather increasing than diminishing. A list which we have before us, from the year 1806, shews that during that year the number of persons who lived beyond 100 years in Great Britain, was not less than 48, out of whom eleven died at the age of 100; fifteen between that of 105 and 110; four between that of 110 and 120, and four others between that of 120 and 134. Twenty-nine of the number were females and the remaining nineteen were males. Of the females, only one is mentioned as not having been married; forty were at the time of their decease, inhabitants of England and Wales; two of Scotland, three of Ireland, and three of other parts of the British dominions.

The details concerning these persons and their mode of living, are exceedingly scanty. It appears, however, that their easy and tranquil life and sobriety must have materially contributed to their old age. There is no doubt, but that long life can be obtained, especially by such means as promote health and vigor, and consequently qualify the individual the better to enjoy existence, nor would it be at all desirable under other circumstances. But what shall we say of the numerous instances of old age in such situations and under such circumstances, which, according to our common opinions, ought to shorten essentially the period of human existence? Baron de Grimm, in his Correspondence, a very recent and extremely interesting publication, reckons the death of perhaps more than a hundred persons of some note in the world of letters, all his cotemporaries, among whom we scarcely meet with an individual who is less than seventy or eighty years of age—and no very small proportion actually last till near ninety or an hundred, although

most of them lived in the capitals of Europe, indulged in all the reasonable pleasures and sometimes in the sensualities of life, and were more or less possessed of that irritability, which is so often the lot of genius.* Would it be presumptuous to attribute this phenomenon in the latter class of people to the prevalence of the nervous system? That persons, whose minds are enlarged, are commonly possessed of a larger mass of brain is now almost generally admitted by physiologists, and we remember to have heard a very able defence of this opinion from the mouth of the celebrated Cuvier, when attending his lectures on comparative anatomy. It is highly probable that the size of the medulla oblongata and of the medulla spinalis is always in proportion to that of the brain. This being admitted, we may easily find the solution of our problem, if we call to our assistance the recent and admirable discoveries of Dr. Le Gallois, on the principle of life, [which may hereafter form the subject of a particular article in our journal.] He has proved beyond any doubt, that the heart receives the principle of its life, and of its power, from the medulla spinalis, so that we may be nearly persuaded, that *whenever there is no organic derangement*, not only the extent of the mental faculties, but also the length of life itself will essentially depend on the size and development of the nervous system.

METHOD OF BREAKING UP STUMPS AND LOGS OF WOOD.

The usual way of breaking up logs of wood for the purposes of fuel, is by axes and driving wedges in This, particularly in roots of trees, is very laborious. It is also sometimes done by gunpowder, in the same way as stones and rocks are blasted; but this is very troublesome, as the plug is often driven out. A better method of performing this operation has lately been invented. A hole is bored with an auger, and a charge of gunpowder introduced. An iron-screw, with a good thread, having a hole bored through its axis, is then introduced into the hole, and turned till it come near to the powder. While the screw is putting in, a wire is kept in the hole through its axis, but it is

* Vatum irritabile genus.

afterwards drawn out, and a piece of twine dipped in a solution of nitre is put into its place. This quick match is set fire to, and by its slow burning, affords time to the operator to retire before it sets fire to the gunpowder.

By this means any roots or old stumps of trees may be easily broken up.

METHOD OF RENDERING BEAVER AND OTHER HATS WATER-PROOF.

Take a thin shell, made of wool, hair and fine beaver, to form the crown of the hat, and another shell or plate, of the same materials, for the brim. These parts are dyed black, and finished without glue or other stiffening, in order that they may not be injured by the rain, which in other beaver-hats, after being exposed to a heavy shower of rain, draws out the glue, which sticks down the nap, and makes it appear old and greasy. The shell may be made in one piece only, in the shape of the hat, blocked deep enough to admit of the brim being cut from the crown. The under side of the shell and the inside of the crown must then be made water-proof by first laying on a coat of size or thin paste, strong enough to bear a coat of copal-varnish; and when thoroughly dry, another coat of boiled linseed-oil. When dry, the crown must be put on a block, and a woollen or cotton body or shape, wove on purpose, put into the inside of the crown, and cemented in. When dry it must be finished with a hot iron, and the crown is done. The brim must in like manner be cemented to a substance or body made with woollen or other fit material, sufficiently thick to make the inside of the brim. The brim and the body are now to be pressed together, after which the underside of the brim may be covered with another shell of beaver or silk-shag. The crown and brim are to be sewed together, the edge of the brim must be rited and varnished with copal-varnish and boiled linseed-oil, to prevent any rain getting in. The cement used for sticking the parts together may be made with one pound of gum Senegal, one pound of starch, one pound of glue, and one ounce of bees-wax, boiled in about one quart of water. Hats made in this way require only to be wiped dry after being exposed to the heaviest shower.

POETRY.

*THE EARTHQUAKE OF CARACCAS.**

THE morning dawn'd, the sun its splendors shed,
And o'er heaven's arch a clear effulgence spread;
The warbling songster tuned the note of love,
And echo trill'd it through the shady grove.
In GOD'S high temple swell'd devotion's song,
The winding aisles the sacred sounds prolong,
To one supreme the solemn crowds addrest
An incense rising from a people's breast!
While thus Caraccas sought the Godhead's care,
And fervent thousand's bent in earnest prayer,
Earth shook, terrific glow'd the flaming skies,
Wild horror reign'd and rent the air with cries:
The crashing edifice in ruin spread,
Entomb'd alike the living and the dead;
From earth's abyss electric flashes pour'd,
Death frown'd where'er the gushing torrent roar'd.
How chang'd the scene! how still the spacious street
Where busy circles oft were wont to meet!
With souls adventurous sketch'd mercantile views,
Told some shrewd joke, or eager asked the news!
How chang'd the closing from the op'ning day!
No more the warbling carol wakes the spray;
The song of mirth, the busy hum is o'er,
And thousands sleep, alas! to wake no more.

The wretched widow wanders wild and lone,
Seeks her dear lord with agonizing moan,
Tosses her arms, her lovely tresses rends,
Flies to each corse, and silent o'er it bends;

* This poetical description of the earthquake of Caraccas, is extracted from *The Year, a poem in three cantoes, by William Leigh Pierce, esq.* In our next Number we shall present our readers with a Review of this interesting work.

Alas! disconsolate, dejected fair,
Vain all your search, vain all your tender care;
Where spread around, yon shatter'd turret fell,
Beneath lies crush'd the form you lov'd so well.
Along the pile with quick and hurried pace,
With vacant stare, and pale averted face,
Methinks I see some lovely damsel tread
The ruin'd mass and mark the heaps of dead;
Each half chok'd avenue she vainly tries,
O'er yon dismantled dome, yon arch'd roof flies,
Hastes to the lofty chapel's shatter'd walls,
On her lost lover, her Alonzo calls;
Lists for a moment:—all is mute and still!
Save the shrill echo from the neighboring hill.
She calls again!—no answering voice she hears,
Beats her white breast, and seeks in vain for tears:
Reckless she roams, and raves with frantic pain,
Clasps her soft hands, and binds her burning brain.
Hope for a moment with illusive wile,
Points the poor mourner to yon steepy pile;
"Tis he." the wretched girl delirious cries,
And then to clasp the airy phantom tries;
She can no more;—and with one pitying shriek
Nature resigns?—her aching heartstrings break.
How oft, by fortune's dangerous gifts beguil'd,
We plough the ocean, pierce the desert wild.
Sad was his fate, in that tremendous hour,
Who left his friends, and left his native shore,
Whelm'd in the common lot—with strangers dies,
Where no dear hand might close his friendless eyes.*
No more Caraccas shall thy city raise,
The lofty promise of its former days;
O'er all thy domes, and o'er thy wretched race,
With ivy-bound, stern ruin waves his mace.

* Mr. Cromwell, a young merchant from New-York, was the only American citizen that perished.

CAROLINE.

By Thomas Campbell, (not published in his works.)

GEM of the crimson-color'd even,
Companion of retiring day,
Why at the closing gates of heaven,
Beloved star, dost thou delay?

So fair thy pensile beauty burns
When soft the tear of twilight flows,
So dire thy plighted step returns,
To chambers brighter than the rose.

To peace, to pleasure, and to love,
So kind a star thou seem'st to be,
Sure some enamor'd orb above
Descends and burns to meet with thee.

This is the breathing, blushing hour,
When all unheavenly passions fly;
Chas'd by the soul-subduing power
Of love's delightful witchery.

O! sacred to the fall of day
Queen of propitious stars appear!
And early rise, and long delay
When Caroline herself is here.

Shine on her chosen green resort,
Where trees the sunward summit crown;
And damask flowers that well may court
An angel's feet to tread them down.

Shine on her sweetly scented road,
Thou star of evening's purple dome!
That lead'st the nightingale abroad,
And guid'st the pilgrim to his home.

Shine where my charmer's sweeter breath
Embalms thy soft exhaling dew;
Where dying winds a sigh bequeath
To kiss the cheek of rosy hue.

Where winnow'd by her gentle air
Her silken tresses darkly flow,
And fall upon her brows so fair,
Like shadows on the mountain snow.

Thus, ever thus, at day's decline,
In converse sweet to wander far,
O! bring with thee my Caroline,
And thou shalt be my ruling star.

SONG OF DWINA.

[From Miss Baillie's Plays.]

WAKE awhile and pleasant be,
Gentle voice of melody.
Say, sweet carol, who are they
Who cheerly greet the rising day?
Little birds in leafy bower;
Swallows twitt'ring on the tower;
Larks upon the light air borne;
Hunters rous'd with shrilly horn:
The woodman whistling on his way;
The new wak'd child at early play,
Who barefoot prints the dewy green
Winking to the sunny sheen;
And the milk maid who binds her yellow hair,
And blithly doth her daily task prepare.
Say, sweet carol, who are they
Who welcome on the ev'ning gray?
The housewife trim, and merry lout,
Who sit the blazing fire about;
The sage a conning o'er his book;
The tired wight in rushy nook,
Who half asleep but faintly hears
The gossip's tale hum in his ears;
The loosen'd steed in grassy stall;
The Thanies feasting in the hall;
But most of all the maid of cheerful soul,
Who fills her peaceful warrior's flowing bowl.
Well hast thou said! and thanks to thee,
Voice of gentle melody!